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1959-1960

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THE Association was organized in Boston, Mass., on June 21, 1882, with the object of providing its members with means of social intercourse and for the exchange of knowledge pertaining to the construction and management of water works. From an original membership of only TWENTY-SEVEN, its growth has prospered until now it includes the names of over 1000 men. Its membership is divided into six classes, viz.:

A Member shall be an officer or employee of a public or private water works, an engineer, chemist or other person qualified to aid or interested in the advancement of knowledge relative to water works.

An Honorary Member shall be a person of acknowledged eminence in some branch of water supply or of engineering.

A Junior shall be not less than eighteen years nor more than twenty-five years of age, a student or connected with water supply work.

An Associate shall be either a person, firm or corporation engaged in manufacturing or furnishing materials or supplies for the construction or maintenance of water works.

A Corporate Member shall be either a Water Board, Commission, Company or Municipal Corporation.

The initiation fees and annual dues are as follows:

Initiation Fees		*Annual Dues*	
Members	$ 3.00	Members	$ 8.00
Juniors	1.00	Juniors	3.00
Associates	10.00	Associate	25.00
Corporate Members	10.00	Corporate Members	15.00

This Association has at least eight regular meetings each year, of which five are held in Boston, one in northern New England, one in southern New England, and one, the annual convention, held in September or October on such date as the Executive Committee may designate.

Making a 6" outlet under pressure in a 20" Lock Joint Prestressed Concrete Cylinder Pipe.

Tapping a 1" house connection under pressure in Lock Joint Concrete Pressure Pipe.

TAPPING LOCK JOINT CONCRETE PRESSURE PIPE

Simple . . . Efficient . . . Time-tested Thousands of field installations have proved the ease and efficiency with which LOCK JOINT CONCRETE PRESSURE PIPE can be tapped under pressure. Service connections as well as larger outlets up to 36" in diameter can be made without interruption of service or damage to the line.

In addition to safe, easy tapping of all diameters, LOCK JOINT CONCRETE PRESSURE PIPE also combines long life, dependability, permanent high carrying capacity, ease of installation, and negligible maintenance. These features make it the logical choice for distribution piping as well as water transmission lines.

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Sales Offices: Chicago, Ill. • Columbia, S. C. • Denver, Col. • Detroit, Mich. • Hartford, Conn. • Kansas City, Mo. • Perryman, Md.

Pressure • Water • Sewer • REINFORCED CONCRETE PIPE • Culvert • Subaqueous

NEW CAMPAIGN STARTS COMMITTEES ACROSS

For the first time, a nationally organized plan to develop local action to combat our growing water shortage has been devised by a supplier to the industry. The need for a campaign to stimulate such action was recognized by the Cast Iron Pipe Research Association. Here's how the first year of the campaign was planned—and the successful results it produced.

Frank ads warned of shortage

The theme of the ad campaign "What Will You Do Without Water?" was coupled with dramatic photographs of people using water in everyday situations.

Informative booklet told how everyone could help

Each ad offered the booklet "Water—Make Sure You'll Always Have Plenty," which outlined working plans for local action against water problems.

Response was heavy!

The American people reacted immediately; thousands of requests, from every state in the Union, have already been sent in for the booklet—but that's not all!

LOCAL WATER IMPROVEMENT THE COUNTRY!

Research shows people took action!

The average person who wrote in for the booklet did at least three things. For instance:

1. He informed neighbors and friends of the problems, discussed solutions, and sought more information.
2. He requested a starter kit from Cast Iron Pipe Research Association—to help spur more interest and plan new and better water facilities.
3. He formed or joined a local water improvement committee in order to take direct and immediate action.

Here are just a few of the remarks received on the worth and completeness of the program.

From a housewife in Connecticut: *"Although I had no such intentions before, I'm going to do something about the suggestions given."*

From a teacher in the state of Washington: *"Last month I was elected as a trustee for the Local Water User's Corporation. We are now in the process of installing a new water reservoir; your program was a very helpful source of information."*

From a retired man in Florida: *"Our city is talking of putting in a new water supply system in order to tap river water. Your literature has been very useful."*

The American people are interested and willing to face the problem; they need only your guidance.

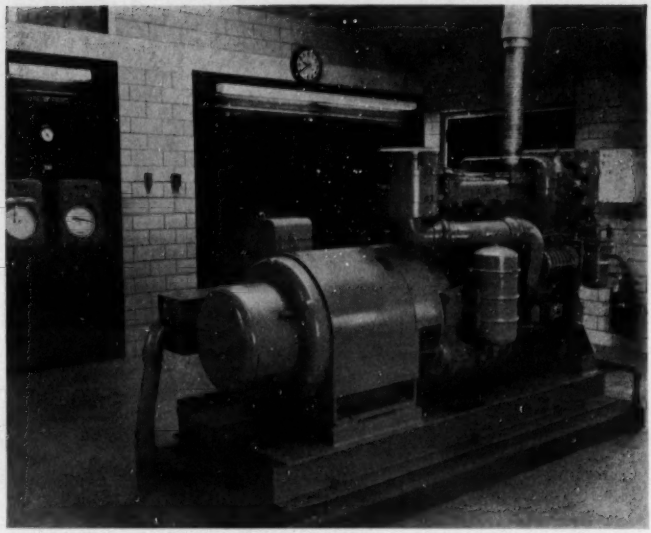
Now . . . A complete program for you!

A complete portfolio has been compiled for you—to help you stimulate action in your community . . . to help you answer some of your own local water problems. If you are now faced with a local water problem in which community relations will play an important part, write on your letterhead to the Cast Iron Pipe Research Association, 3440 Prudential Plaza, Chicago 1, Ill., Thos. F. Wolfe, Managing Director.

The Cast Iron Pipe Research Association is proud of the job it has done—and looks to the future with confidence that the American people can and will lick the water problem!

CAST IRON PIPE

THE MARK OF THE 100-YEAR PIPE



Diesel Generator Set
Brunswick and Topsham Water District
Brunswick, Maine

This 125 KW CUMMINS Diesel Generator Set provides stand-by power at Taylor Farm Supply, Brunswick and Topsham Water District. The generator set is specially designed to start a 100 HP pump motor.

Camp, Dresser and McKee of Boston, Massachusetts, were the engineers for this unusual application of diesel power.

CUMMINS DIESEL OF NEW ENGLAND, INC.
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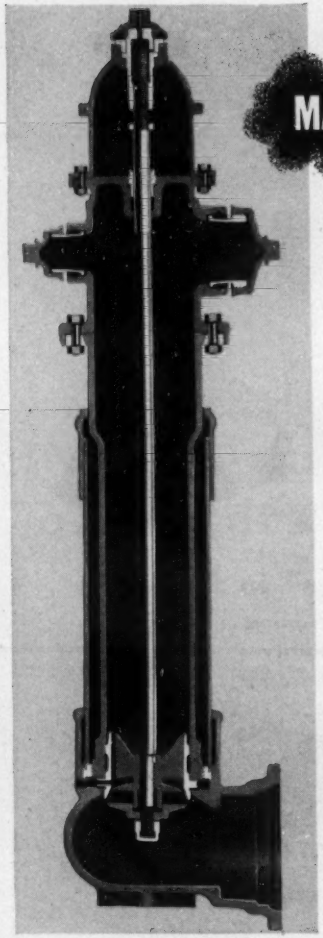


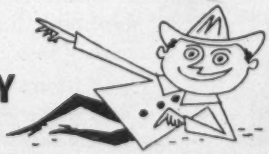
MATHEWS HYDRANTS

The Mathews Modernized Hydrant Supplies the 4 Fundamental Requirements for Effective Community Protection

and many other quality features, too

- Replaceable barrel for maximum efficiency—quickly replaced in case of accident without excavating
- Head revolves 360°; simply loosen bolts and rotate
- Stuffing box plate cast integrally with nozzle section—eliminates extra part and provides positive, leakproof construction
- Operating thread, protected by stuffing box plate, operates free of rust, sediment and ice

Also . . . Nozzle sections supplied with hose or pumper outlets as specified • Operating thread cannot be bent • Compression-type main valve prevents broken Mathews from leaking • Nozzle level can be raised or lowered without excavating • Bell, mechanical-joint, or flange-type pipe connections • Conventional or "O" ring packings



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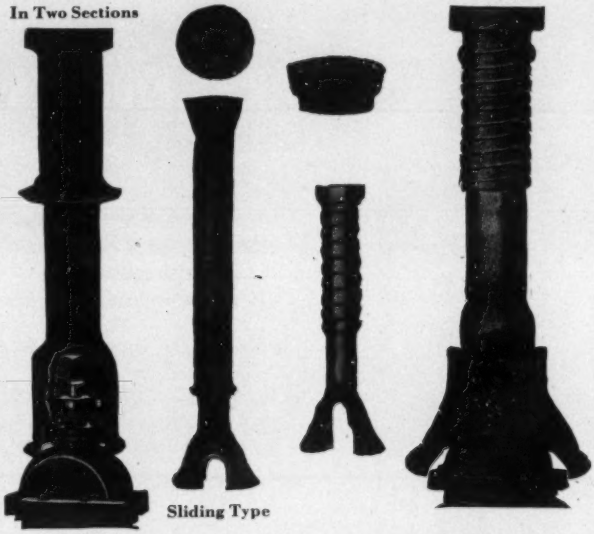

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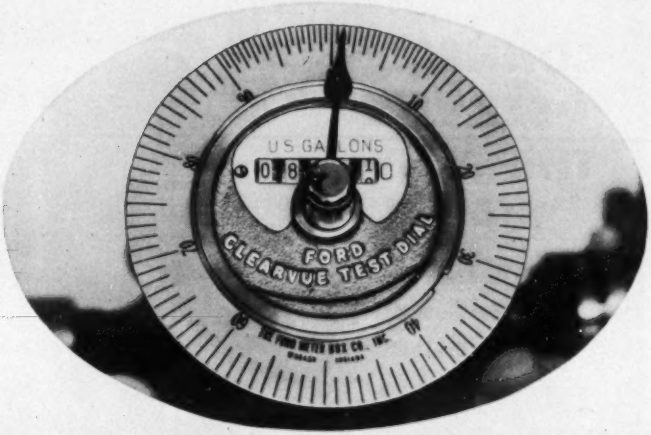
Manhole Frames and Covers

CULPEPER, VIRGINIA



For Accurate Reading of Meters on Test . . .

Meter dials are read accurately . . . down to ½ of 1% . . . when equipped with the Ford Clearvue Test Dial. May be used on any straight or round reading register between 2½" and 3" in diameter, except those with a sweep hand in the center. It makes no difference whether meter reads in gallons, cubic feet or liters. Calibrated aluminum ring, 5" in diameter, can be turned to any position for start of test.

THE FORD METER BOX COMPANY, INC.
Wabash, Indiana

FOR BETTER WATER SERVICES **FORD**

CONNECT SERVICES THE EASY WAY!

MUELLER® E-4 drilling machine

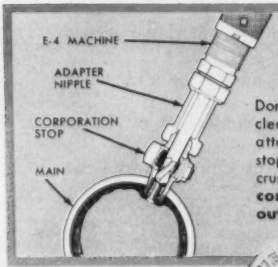
Just a few simple steps are all that are needed to quickly and easily connect service lines, under pressure, to any type main with Mueller E-4 Machine.

As illustrated, the "E-4" is attached to the outlet of the corporation stop and the main is drilled by advancing the drill through both the open stop and the service clamp.

The simple, rugged design of the E-4 Machine and the variety of drills and adapters available make it an extremely useful water works tool.

Write for complete information.

SPECIFICATIONS
Drills from ¼" through 1"
Boring bar travel — 9⅜"
500 p.s.i. at 100°F.
250°F. at 375 p.s.i.
Now furnished in fitted, steel carrying case.



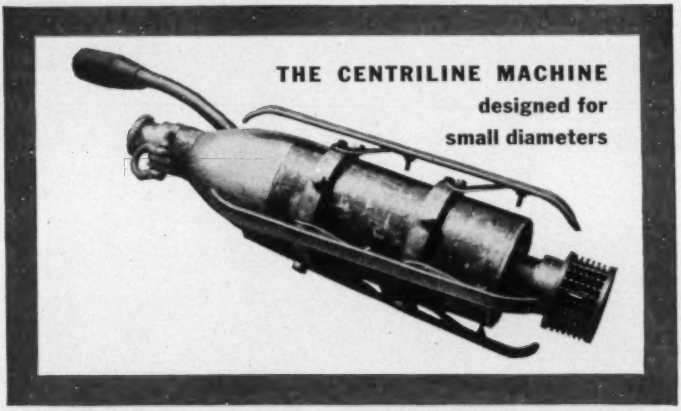
clean corporation stops under pressure!

Don't abandon clogged corporation stops when cleaning mains and replacing service lines. Simply attach the E-4 Machine to the outlet of the installed stop, open stop and drill out all deposits and incrustations as shown. **Full unrestricted flow of corporation stop is quickly restored without shutting off the main.**

MUELLER CO. **DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles
In Canada: Mueller, Limited; Sarnia, Ontario

NOW! THE CENTRILINE PROCESS is available for 6" to 14" mains, too!



Yes, your city's small but important transmission and distribution lines can also regain their original flow capacity and pressure through the universally accepted Centriline Process of centrifugally applying a cement-mortar coating to the pipe walls. If some of your lines inadequately serve your customers' requirements, including higher demands for fire protection, investigate the numerous advantages of Centrilining your mains now.

The new, small diameter Centriline Machine eliminates most excavations at valves, laterals and corporation cocks. By eliminating these fixed costs, lengthening the distances between access openings and permitting faster lining speeds, the new Centriline Machine has really reduced the cost of lining small mains. So much so, in fact, that every water works operator should reevaluate the economics of small pipe rehabilitation.

Send today for your copy of our illustrated booklet which fully describes how Centriline can help you salvage worn out pipes from 6" to 144" in diameter permanently and for much less than you would imagine.

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Branch Offices in Principal Cities of the United States, Canada and Latin America.

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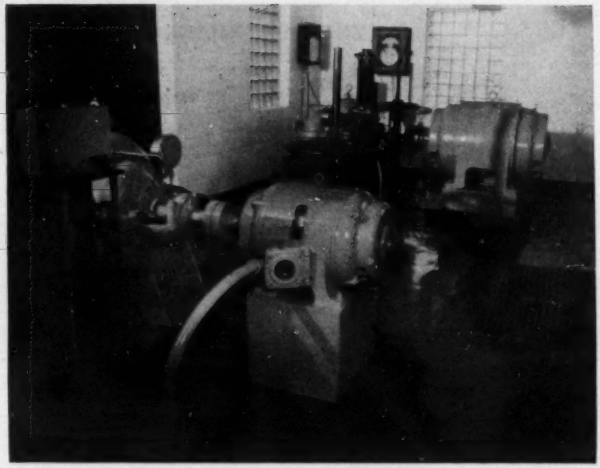

Marblehead Booster Station
Marblehead, Mass.

Shown in foreground is 15 HP motor driven Fairbanks-Morse 12″ split case centrifugal pump — 3500 GPM at 9′ TDH. Other unit is 100 HP motor driven Fairbanks-Morse 14″ split case centrifugal pump — 5150 GPM at 65′ TDH.

HALEY & WARD, ***Consulting Engineers***
Boston, Mass.

RALPH P. HALL CO., INC., ***Builder***
Stoneham, Mass.

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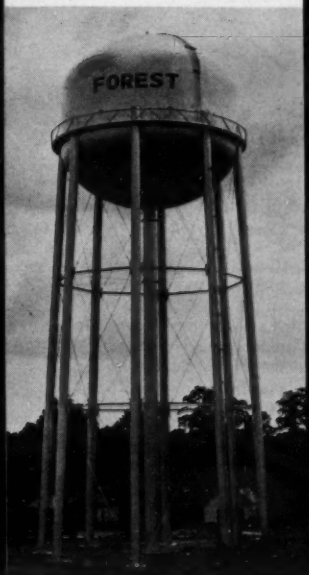
178 Atlantic Avenue **Boston 10, Massachusetts**

Telephone: LAfayette 3-3600

BEAVER, IOWA
25,000 gallons

HANOVER, VIRGINIA
60,000 gallons



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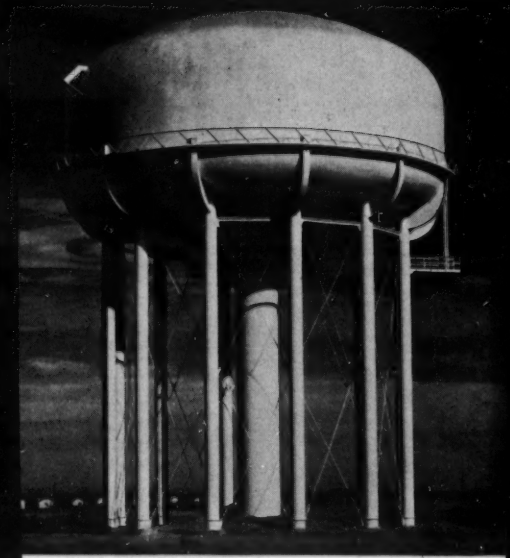
ELEVATED STEEL TANKS

BETTER ELEVATED WATER STORAGE

comes in all sizes to serve every need

Pittsburgh-Des Moines' resources as pioneer builders of steel elevated tanks include every type of structure, in every capacity to meet your individual water storage needs—fabricated and erected with expert craftsmanship and a responsible guarantee of satisfaction.
Write for our latest "Modern Water Storage" brochure: 20 pages of interest and information!



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Pittsburgh-Des Moines Steel Company

Plants at

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Chicago (3)	628 First National Bank Bldg.	Seattle (1)	Suite 332, 500 Wall St.
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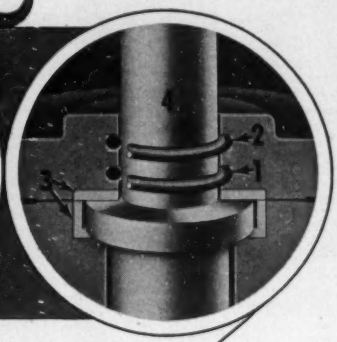
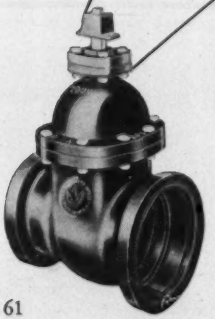
Jacksonville	1757 River Road	El Monte, Calif.	P. O. Box 3012

DOUBLE SEALING



SMITH VALVES WITH "O" RING SEALS



"O" Rings, due to their simplicity and reliability have been used for many years in military and industrial products. Smith non-rising stem valves are available with *double* "O" Ring seals. The lower "O" Ring (1) seals the internal pressure, while the upper "O" Ring (2) is a combined external dirt and reserve pressure seal. This construction eliminates packing, gland adjustment, and conventional stuffing box. All Smith AWWA specification valves are equipped with stem (thrust) collar bushings (3) and extra large, high strength bronze stems (4). These and other well known Smith superior design features assure positive operation, long service life, and minimum maintenance.

61

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THE A.P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

M-Scope "Master" Electronic Witch
Leak Survey Instrument and Pipe Locator

The transistorized "MASTER" Leak Detector—Pipe Finder Combination is the first dual purpose instrument with separate and independent leak detector and pipe finder circuits. Now you can have two instruments in one without any compromise in performance. The "MASTER" Leak Detector—Pipe Finder incorporates the very latest advances in electronic construction and circuitry in addition to having an exceptionally long battery life. An ideal instrument for any Water Department.

Finding a leak under pavement

Locating a leak at the valve

Location of dead ends

Locating a service

Write for information, demonstration or trial.

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JOSEPH G. POLLARD CO., INC.

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Place your next order with POLLARD

If it's from POLLARD . . . It's the Best in Pipe Line Equipment

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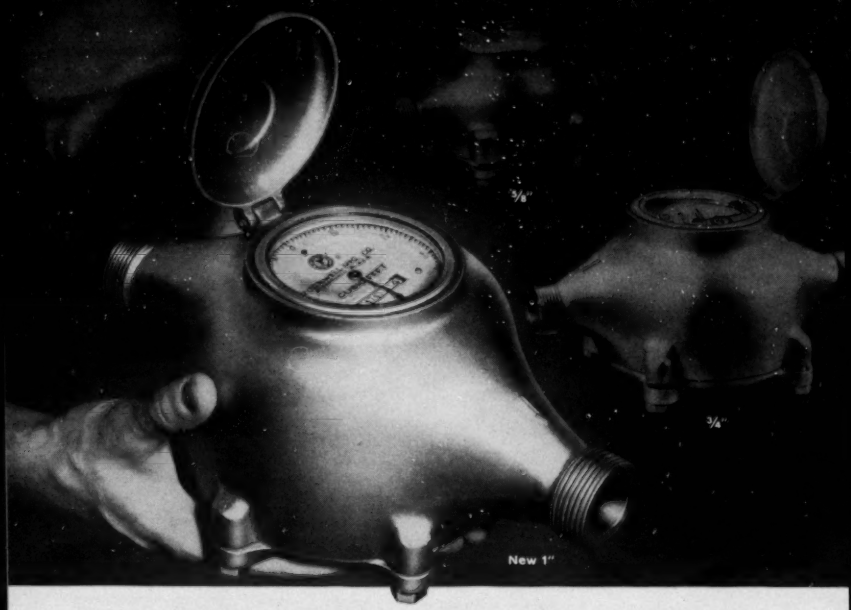
Now there are three sizes!



PRESENTING THE NEW 1" SIZE

ROCKWELL SEALED REGISTER METER

Another Milestone in Magnetic Metering. Now you can meter 1" services with the same exclusive advantages proved nationwide by thousands of smaller size Rockwell Sealed Register meters. These include a powerful magnetic drive which eliminates all need for a stuffing box—a hermetically sealed register that never fogs or corrodes and is always easy to read—a construction that's easy and economical to repair . . . a construction in which only two parts operate in water.

The larger the meter size, the greater the opportunity for revenue loss through faulty performance; the more costly become repairs and meter shop operations. That's why Rockwell has invested heavily to extend the Sealed Register meter line. Never in history has there been a meter design which required so little maintenance and never one that exactly suited the needs expressed by practical water works operating men. Just try them and see. Write to Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.

SEALED REGISTER METERS

another fine product by

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SAYS A CITY ENGINEER:

"L&R gate valves pass our 3-point test!"

Many engineers and waterworks superintendents ask themselves this question before specifying a particular gate valve:

"Does it operate easily, efficiently and dependably?"

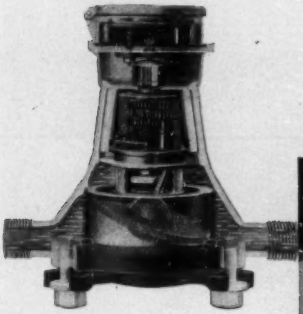
Ludlow gate valves and Rensselaer gate valves meet all three of these basic requirements. They give you watertight closure through years of dependable, trouble-free performance. Simple in design and easy to operate, they exceed A.W.W.A. specifications.

FOR EASE AND DEPENDABILITY use Ludlow and Rensselaer tapping sleeves and valves for branchline connections to main lines under pressure.

WRITE FOR THE L&R GATE VALVE CATALOG, showing the most complete selection of outstanding design features available today. There are sizes from 2" to 72", plus custom designing for special applications.

LUDLOW & RENSSELAER
VALVES AND HYDRANTS

THE LUDLOW VALVE MANUFACTURING CO., INC., TROY, N. Y. – SINCE 1861



HOW TO DEVELOP MORE

EFFICIENCY

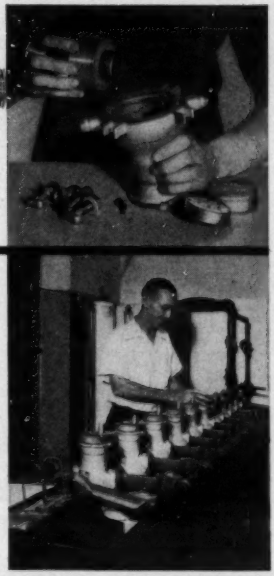
IN YOUR METER SHOP

When a meter man learns one Trident, he learns them all. Instead of spreading his knowledge thin over many types and models of household meters, he can concentrate on the fine points of just one, and can quickly learn to do a job of which he can be proud.

Trident interchangeability is the big reason. Parts made for the most up-to-date Tridents are designed to fit into any older Trident of the same size and type. Reordering and stock control are simplified, too. No need to keep parts for many models. Just stock a small supply of the latest Trident parts.

You need never scrap a Trident because it is a "discontinued" model. In the process of replacing work-worn parts with new, improved parts over the years, you actually modernize all the Tridents in your system.

This 50-year policy of Trident is your best assurance that the modern Tridents you buy today will earn maximum revenue for your utility . . . with lowest yearly costs . . . for many years to come.



It takes money to maintain the water supply your community expects. It's vitally important to make sure all the water pumped is paid for . . . by using accurate meters . . . and by keeping these meters in good repair.

2895

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100% MAINTENANCE-FREE

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FOUNTAIN OF YOUTH, 1880... The well of the Little Red Schoolhouse was a popular, if not always healthful, gathering place for children. The old tin dipper in its lip-to-lip travels carried more than its share of disease.

THE MODERN DRINKING FOUNTAIN...eliminates the community cup... substitutes for it clean, pure, safe water distributed nationwide over a network of dependable cast iron pipe.

U.S. cast iron PIPE

FOR WATER, SEWERAGE AND

U. S. PIPE AND FOUNDRY COMPANY

but better than ever today!

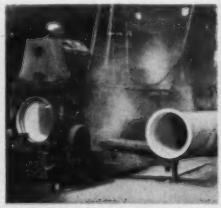
Care and precision from mine to main insure U. S. Pipe quality

The nation's health depends largely on water. And most of this water is distributed through cast iron pipe.

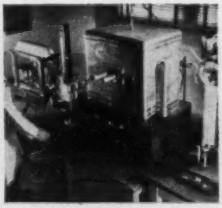
U. S. Pipe, therefore, exerts every effort to make its product dependable, long-lived and trouble free. From mining of ore... through blast furnace... to final shipping, every length of U. S. Cast Iron Pipe is checked and rechecked for quality.

This end-to-end supervision is another reason U. S. Pipe measures up to the promises made for it... and to the responsibilities placed on it in service.

QUALITY BEGINS HERE . . . at one of U. S. Pipe's mines near Birmingham where ore is mined.



PIPE NEWLY CAST . . . 24" diameter and 18 feet long rolls out on skids from centrifugal casting machine.



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*Pat. applied for in U. S. A. and foreign countries

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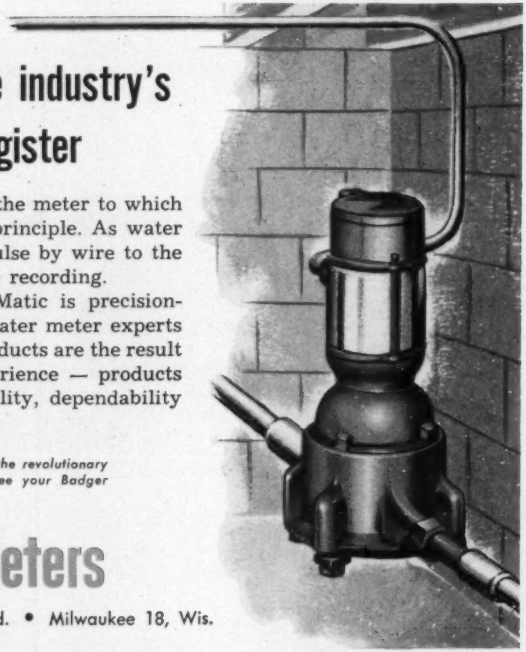

The Badger Read-o-Matic is powered entirely by the meter to which it is attached . . . works on an exclusive "pulse" principle. As water flows through the meter, the generator sends a pulse by wire to the Badger Read-o-Matic register outside for accurate recording.

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NEW ENGLAND WATER WORKS ASSOCIATION
ORGANIZED 1882

VOL. LXXIII DECEMBER, 1959 NO. 4

This Association, as a body, is not responsible for the statements or opinions of any individual.

THE WACHUSETT-MARLBOROUGH TUNNEL

BY CHESTER J. GINDER*

[*Read February 19, 1959.*]

The Wachusett-Marlborough Tunnel described in this paper is being built as an extension to the pressure distribution lines of the Boston Metropolitan Water District. It is being constructed by the Metropolitan District Commission from designs prepared by the Construction Division of the M.D.C. This tunnel will extend from Wachusett Reservoir in Clinton, through Berlin and Northborough for a distance of about 8 miles to a point in Marlborough, at the upstream end of the present pressure-aqueduct line. It will replace an existing grade-line aqueduct built in 1905 between the same two locations, known as the Wachusett Aqueduct.

Until about 1940 the aqueduct lines carrying water from Wachusett Reservoir to Boston were grade-line aqueducts over the entire distance of 25 miles. In 1941 part of this grade-line system was supplemented or replaced by a pressure-aqueduct system from just west of the city to a point in Marlborough. The new tunnel will extend this pressure-aqueduct system westerly to Wachusett Reservoir and not only will have a capacity much greater than the aqueduct it will replace, but will operate under gradients higher than those of the present system.

The entire project will be built in two stages. The first includes the construction of three shafts and the tunnel itself, and the second stage will include facilities and controls at each shaft and the actual connections to the system. The tunnel will be in deep rock, lined throughout with concrete, with a finished diameter of 14 ft.

The construction of the Wachusett-Marlborough Tunnel

*Designing Engineer, Construction Division, Metropolitan District Commission, 20 Somerset St., Boston, Mass.

was authorized by Chapter 685 of 1956, and other legislation with respect to water-supply developments preceding this act.

The water supply for the Boston Metropolitan District is presently collected in three principal watersheds; the Swift River watershed in the central part of the State, on which is located the Quabbin Reservoir, having a capacity of 412 billion gal; the Ware River watershed where flood flows are collected; and the Wachusett Reservoir in Clinton on the Nashua River, with a capacity of 65 billion gal.

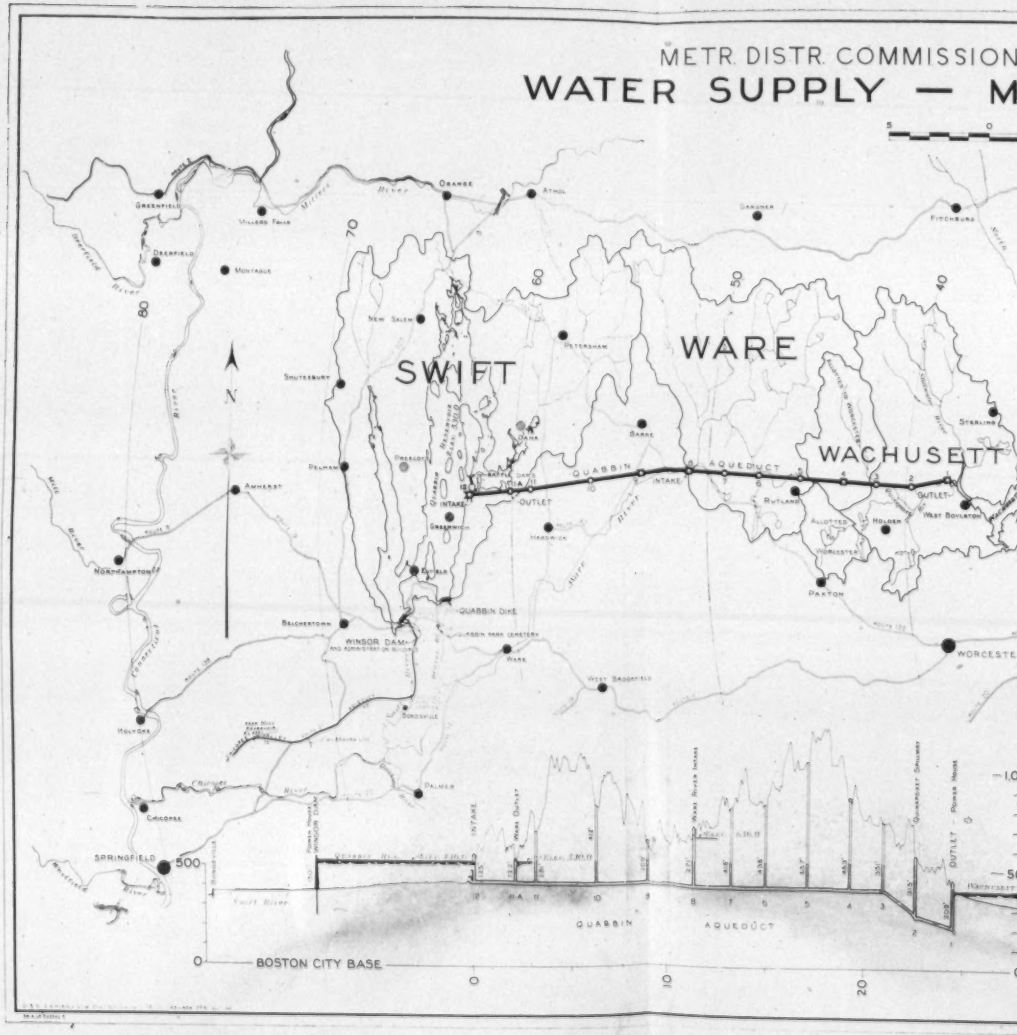
The Quabbin Reservoir is about 65 miles west of Boston, and since the flow line is at Elevation 530, water is brought into the district by gravity with plenty of head available (see Fig. 1).

Between Quabbin Reservoir and Wachusett Reservoir the water is carried through a deep rock tunnel about 25 miles long, built in two sections as part of the major extension which began in 1926. East of Wachusett Reservoir the supply lines were all grade-line aqueducts, which have become inadequate to perform the service required, and these are gradually being replaced by pressure lines. The Wachusett-Marlborough Tunnel will replace the remaining section of grade-line aqueduct east of Wachusett Reservoir.

Review of Earlier Studies

A general over-all plan for developing extensions to the aqueduct system to carry water from Wachusett Reservoir to the District proper was outlined in a special report, House 262, dated December, 1937, recommending the construction of a Pressure Aqueduct and a new high-level reservoir west of Boston, and also recommending a tunnel loop under the city to centers of high demand. The tunnel loop was also intended to pass under centers of high demand in areas north of Boston, namely: Everett, Somerville, Cambridge, Belmont and Watertown.

For those portions of the work considered most urgently needed, immediate construction was recommended. Following this study legislation provided for the construction of the Pressure Aqueduct and Norumbega Reservoir near the Charles River in Weston, which included about 18 miles of aqueduct either in


METR. DISTR. COMMISSION
WATER SUPPLY — M
SWIFT
WARE
WACHUSETT
QUABBIN AQUEDUCT
INTAKE
OUTLET
QUABBIN DIKE
WINSOR DAM
BOSTON CITY BASE
QUABBIN
AQUEDUCT
Swift River
Ware River
Chicopee River
Connecticut River
Millers River
Deerfield River
Westfield River
Greenfield
Orange
Athol
Fitchburg
Montague
Shutesbury
New Salem
Petersham
Barre
Sterling
Pelham
Amherst
Northampton
Belchertown
Greenwich
Rutland
Holden
Worcester
Paxton
West Boylston
Holyoke
Chicopee
Springfield
Palmer
Ware
Dana
Gilbertville
Hardwick
West Brookfield
Sturbridge
Oakham
Barre Falls Dam
Quabbin Park Cemetery
Quabbin Reservoir
Pleasant Valley Reservoir
Shaft 11
Shaft 10
Shaft 9
Shaft 8
Shaft 7
Shaft 6
Shaft 5
Shaft 4
Shaft 3
Shaft 2
Shaft 1
Ware River Intake
Quaboag River Spillway
Outlet - Power House
Intake
Outlet
Reservoir Water Surface Elevation
Pleasant Valley Tunnel
Winsor Dam Tunnel
Ware River Tunnel
Quaboag River Tunnel
Quabbin Tunnel
Aqueduct Tunnel
Wachusett Reservoir
Wachusett Tunnel
Weston Aqueduct
Boston
Dorchester
Roxbury
Brookline
Newton
Waltham
Watertown
Cambridge
Somerville
Chelsea
Revere
Malden
Medford
Everett
Melrose
Stoneham
Wakefield
Reading
Lynnfield
Saugus
Lynn
Swampscott
Marblehead
Salem
Peabody
Danvers
Middleton
Wilmington
Woburn
Winchester
Arlington
Belmont
Lexington
Waltham
Newton
Brookline
Dedham
Milton
Quincy
Weymouth
Braintree
Hingham
Hull
Cohasset
Scituate
Norwell
Hanover
Pembroke
Duxbury
Marshfield
Plymouth
Kingston
Halifax
Plympton
Carver
Wareham
Middleborough
Lakeville
Rochester
Mattapoisett
Marion
Fairhaven
Acushnet
New Bedford
Dartmouth
Westport
Fall River
Somerset
Swansea
Seekonk
Rehoboth
Attleboro
North Attleboro
Norton
Taunton
Berkley
Dighton
Raynham
Easton
Mansfield
Foxboro
Sharon
Canton
Stoughton
Randolph
Holbrook
Avon
Norfolk
Wrentham
Franklin
Bellingham
Medway
Millis
Needham
Wellesley
Natick
Framingham
Ashland
Hopkinton
Holliston
Hudson
Marlborough
Southborough
Northborough
Shrewsbury
Westborough
Grafton
Upton
Milford
Hopedale
Mendon
Blackstone
Millville
Uxbridge
Douglas
Sutton
Millbury
Auburn
Oxford
Webster
Dudley
Charlton
Southbridge
Sturbridge
Brookfield
West Brookfield
Spencer
Leicester
Oakham
Barre
Hubbardston
Rutland
Holden
Paxton
Worcester
Boylston
West Boylston
Sterling
Clinton
Lancaster
Harvard
Bolton
Berlin
Northborough
Southborough
Westborough
Shrewsbury
Grafton
Upton
Milford
Hopedale
Mendon
Blackstone
Millville
Uxbridge
Douglas
Sutton
Millbury
Auburn
Oxford
Webster
Dudley
Charlton
Southbridge
Sturbridge
Brookfield
West Brookfield
Spencer
Leicester
Oakham
Barre
Hubbardston
Rutland
Holden
Paxton
Worcester
Boylston
West Boylston
Sterling
Clinton
Lancaster
Harvard
Bolton
Berlin
500
0
10
20
30
40
50
60
70
80
90
100

Fig

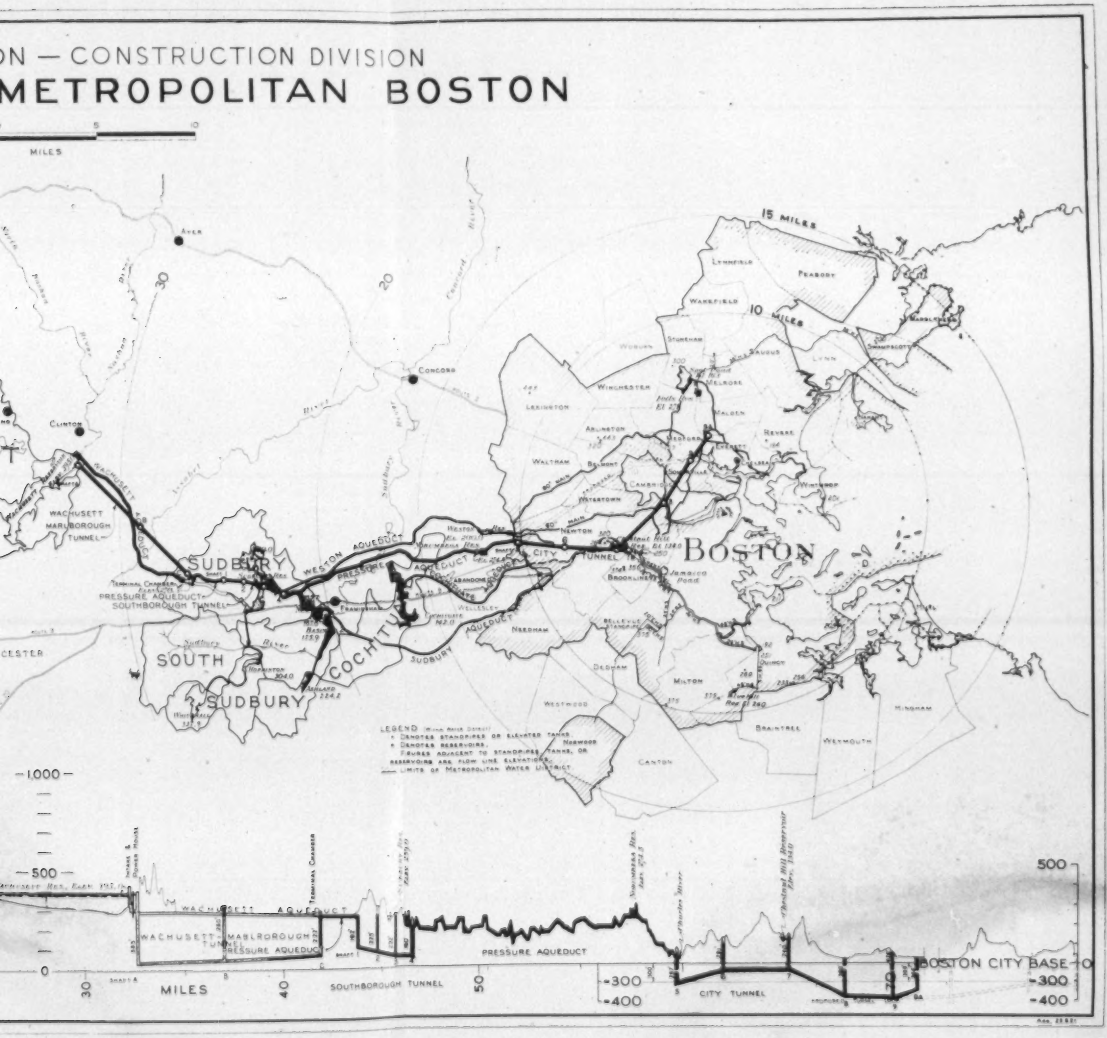
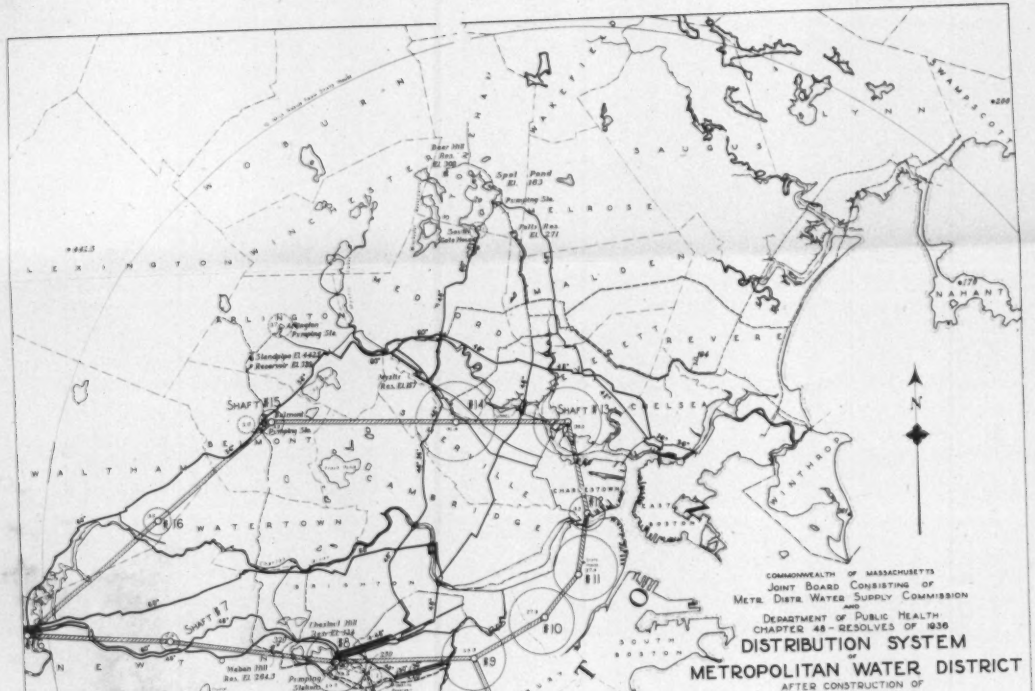

ON — CONSTRUCTION DIVISION
METROPOLITAN BOSTON
MILES
15 MILES
10 MILES
Boston
SUDBURY
SOUTH SUDBURY
COCHITUATE
WACHUSETT MARLBOROUGH TUNNEL
WESTON AQUEDUCT
PRESSURE AQUEDUCT
SOUTHBOROUGH TUNNEL
CITY TUNNEL
BOSTON CITY BASE
LEGEND

FIG. 1.


COMMONWEALTH OF MASSACHUSETTS
JOINT BOARD CONSISTING OF
METR. DISTR. WATER SUPPLY COMMISSION
AND
DEPARTMENT OF PUBLIC HEALTH
CHAPTER 48 - RESOLVES OF 1936
DISTRIBUTION SYSTEM
OF
METROPOLITAN WATER DISTRICT
AFTER CONSTRUCTION OF
N
SHAFT #15
SHAFT #13
SHAFT #7
#14
#16
#11
#10
#9
#8
WOBURN
WINCHESTER
STONEHAM
WAKEFIELD
SAUGUS
BLYNN
SWAMPSCOTT
MELROSE
MALDEN
LEXINGTON
ARLINGTON
MEDFORD
REVERE
NAHANT
CHELSEA
WINTHROP
BELMONT
SOMERVILLE
CAMBRIDGE
WALTHAM
WATERTOWN
BRIGHTON
NEWTON
CHARLESTOWN
EAST BOSTON
SOUTH BOSTON
Spot Pond El. 183
Pumping Sta.
Mystic Res. El. 157
Standpipe El. 442.5
Reservoir El. 320
Pumping Sta.
Chestnut Hill Res. El. 134
Weban Hill Res. El. 264.3
Pumping Station

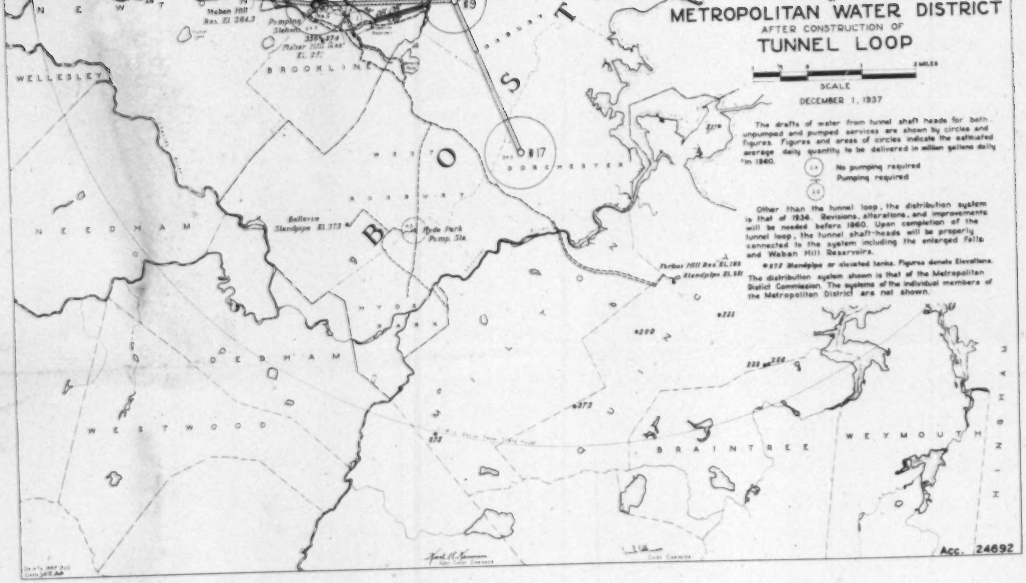

METROPOLITAN WATER DISTRICT
AFTER CONSTRUCTION OF
TUNNEL LOOP
SCALE
DECEMBER 1, 1937
The drafts of water from tunnel shaft heads for both unpumped and pumped services are shown by circles and figures. Figures and areas of circles indicate the estimated average daily quantity to be delivered in million gallons daily in 1960.
No pumping required
Pumping required
Other than the tunnel loop, the distribution system is that of 1936. Revisions, alterations, and improvements will be needed before 1960. Upon completion of the tunnel loop, the tunnel shaft-heads will be properly connected to the system including the enlarged Fells and Weban Hill Reservoirs.
*373 Standpipe or elevated tanks. Figures denote Elevations.
The distribution system shown is that of the Metropolitan District Commission. The systems of the individual members of the Metropolitan District are not shown.
WELLESLEY
BROOKLINE
NEEDHAM
DEDHAM
WESTWOOD
BRAINTREE
WEYMOUTH
Acc. 24692

FIG. 2.

14-foot-diameter tunnel or as cut-and-cover pipelines 11 ft 6 in in diameter, supplementing the old Weston and Sudbury Aqueduct and bypassing the Sudbury Reservoir. The gradients serving the District were raised from Elevation 200 for Weston Reservoir to Elevation 274.5 for the new Norumbega Reservoir. The construction of the tunnel loop was not included in the work at this time but, following this extension to the facilities, the pressure aqueduct was further extended to Chestnut Hill Reservoir by the construction of the City Tunnel—a 12-foot-diameter aqueduct under the city of Newton—which in itself constituted a part of the proposed tunnel loop (see Fig. 2). The City Tunnel, completed in 1950, was the first section of the proposed tunnel loop, recommended in the report, House 262 of 1937, referred to earlier.

In 1953 a second section of the tunnel loop was started between Chestnut Hill and Malden, to serve the northern part of the District This section, about 7 miles in length and recently completed, is 10 ft in diameter and passes under Boston, Cambridge and Somerville, terminating at a distribution point in Malden near the Medford line. In selecting this location a revision in the over-all plan, as outlined in the 1937 report, was made, resulting in a smaller loop running directly to the high-service area north of Boston, and avoiding the low-service downtown district of the city. It is expected that the tunnel loop will be continued under Arlington, Belmont and Watertown, and back to Shaft 5 in Weston, at some future date.

The earlier studies proposed a sequence of construction as follows:

1. A section of pressure aqueduct west of Framingham.
2. A tunnel under Newton to Chestnut Hill.
3. The completion of the tunnel loop.
4. A pressure aqueduct from Framingham to Weston.
5. A second pressure aqueduct from Framingham to Weston in the remote future.
6. An aqueduct from Wachusett Reservoir to the Pressure Aqueduct in the remote future.

As a result of the earlier studies, the opinion was that the

construction of the tunnel loop under the centers of population would enable the area to be adequately served, even though the gradients which would result would be relatively flat. Tunnel sizes of 10 and 12 ft in diameter were proposed, so that the system would operate within the flat gradients.

Construction Sequence Revised

During the latter part of the period in which the construction was to take place, the demand for water in the District increased considerably more than the trend had suggested. From 1930 to 1940 there was very little increase in the daily demand. Figures show about 142 mgd in 1930 and about 143 mgd for 1940, although during that ten-year period there were some years in which more water was used. In 1945, however, the consumption reached 170 mgd, and in 1950 it reached 197 mgd, with a steady increase which has continued to the present time. The demand of the District proper in 1956 was in excess of 201 mgd, and in 1957 more than 208 mgd.

Because of this steady increase and because the construction of aqueducts of the sizes involved requires so long a time to complete, the additional facilities built have not provided the excess capacity in the lines which had been expected. The increase in the facilities for transporting the water has not kept pace with their need.

It has not been possible to maintain Norumbega Reservoir in Weston at Elevation 274.5 as intended, due to lack of capacity in the pressure aqueduct west of the reservoir, and therefore a tunnel loop, regardless of how large it might be, would not correct the situation. The present extension to Malden will relieve the only existing large line to that area, which runs through Arlington to Spot Pond, but the gradients are dependent upon the elevation at which Norumbega Reservoir can be maintained. Except for the extra-high service, the needs of the District could be served quite well if Norumbega Reservoir could be kept at about Elevation 274.5, as originally planned.

In view of this situation attention has been directed to providing some means of increasing the capacity of the aque-

ducts west of Norumbega Reservoir, so as to maintain Norumbega Reservoir at a higher grade. Two plans have been considered, one being the construction of a second aqueduct paralleling the Pressure Aqueduct back to Shaft 4 at Sudbury Reservoir in Southborough, and the other being the extension of the present pressure aqueduct westerly to Wachusett Reservoir, whereby it will be possible to take advantage of additional gradients which could be put on the system and increase the capacity of the existing aqueduct. The spillway at Wachusett Reservoir is at Elevation 395.0, referred to Boston City Base, and so provides an upstream gradient much in excess of that which can be safely used.

This latter plan was adopted and includes the construction of the Wachusett-Marlborough Tunnel, the subject of this discussion. It will operate under gradients ample to supply the district, with present facilities, until 1975. The construction of a second pressure aqueduct will be necessary eventually, but its need has been delayed to the remote future following the construction of the tunnel loop in the distribution area.

The estimated increase in the demand for water on the District sources between the present time and the year 1990 is computed to be about 95 mgd, from a daily demand of 235 mgd to a daily demand of 330 mgd (see Fig. 3). It is presumed that in 1990 it will be necessary to add to the present sources by the inclusion of some additional supply.

The City Tunnel Extension, recently completed, was expected to provide adequate facilities until 1959 or 1960, especially in the northern part of the District. It is not in operation at the present time, because certain pipeline connections which must be made have been delayed by litigation in the courts.

To provide adequate facilities beyond 1960, the Wachusett-Marlborough Tunnel is being built, which will enable satisfactory gradients to be maintained until 1975, at which time the tunnel loop will be needed.

It was determined that the problems of distribution which presently exist would be alleviated to a greater degree, and for less cost, if the sequence of construction were revised so as to build the tunnel at Wachusett Reservoir now, instead of increasing the facilities at the downstream end of the system.

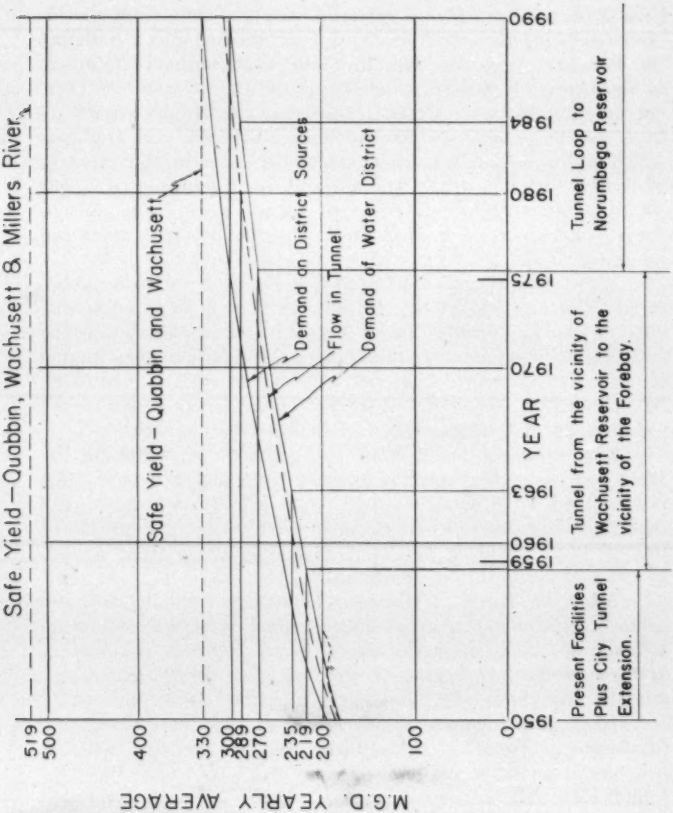


FIG. 3.
METROPOLITAN WATER DISTRICT DEMAND AND PROPOSED FUTURE CONSTRUCTION

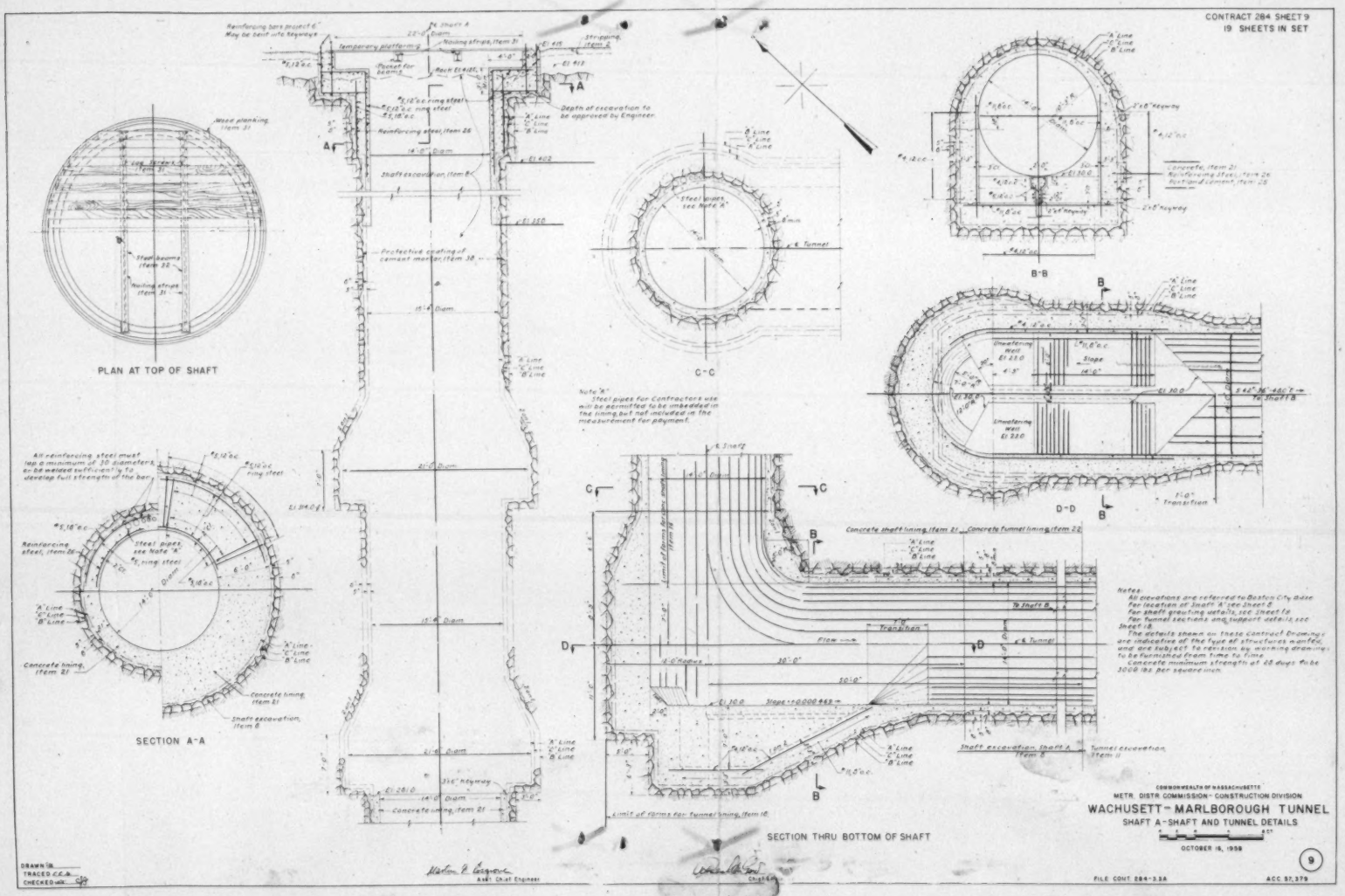

CONTRACT 284 SHEET 9
19 SHEETS IN SET
PLAN AT TOP OF SHAFT
SECTION A-A
SECTION THRU BOTTOM OF SHAFT
B-B
C-C
D-D
Note "A"
Steel pipes for Contractors use will be permitted to be imbedded in the lining but not included in the measurement for payment.
Notes:
All elevations are referred to Boston City Base
For location of Shaft A see Sheet 5
For shaft grouting details see Sheet 16
For tunnel sections and support details see Sheet 18
The details shown on these Contract Drawings are indicative of the type of structures wanted, and are subject to revision by working drawings to be furnished from time to time
Concrete minimum strength at 28 days to be 3000 lbs per square inch
COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. COMMISSION - CONSTRUCTION DIVISION
WACHUSETT - MARLBOROUGH TUNNEL
SHAFT A - SHAFT AND TUNNEL DETAILS
OCTOBER 16, 1950
9
DRAWN
TRACED
CHECKED
FILE CONT. 284-3.3A
ACC. 57,379

FIG. 5.

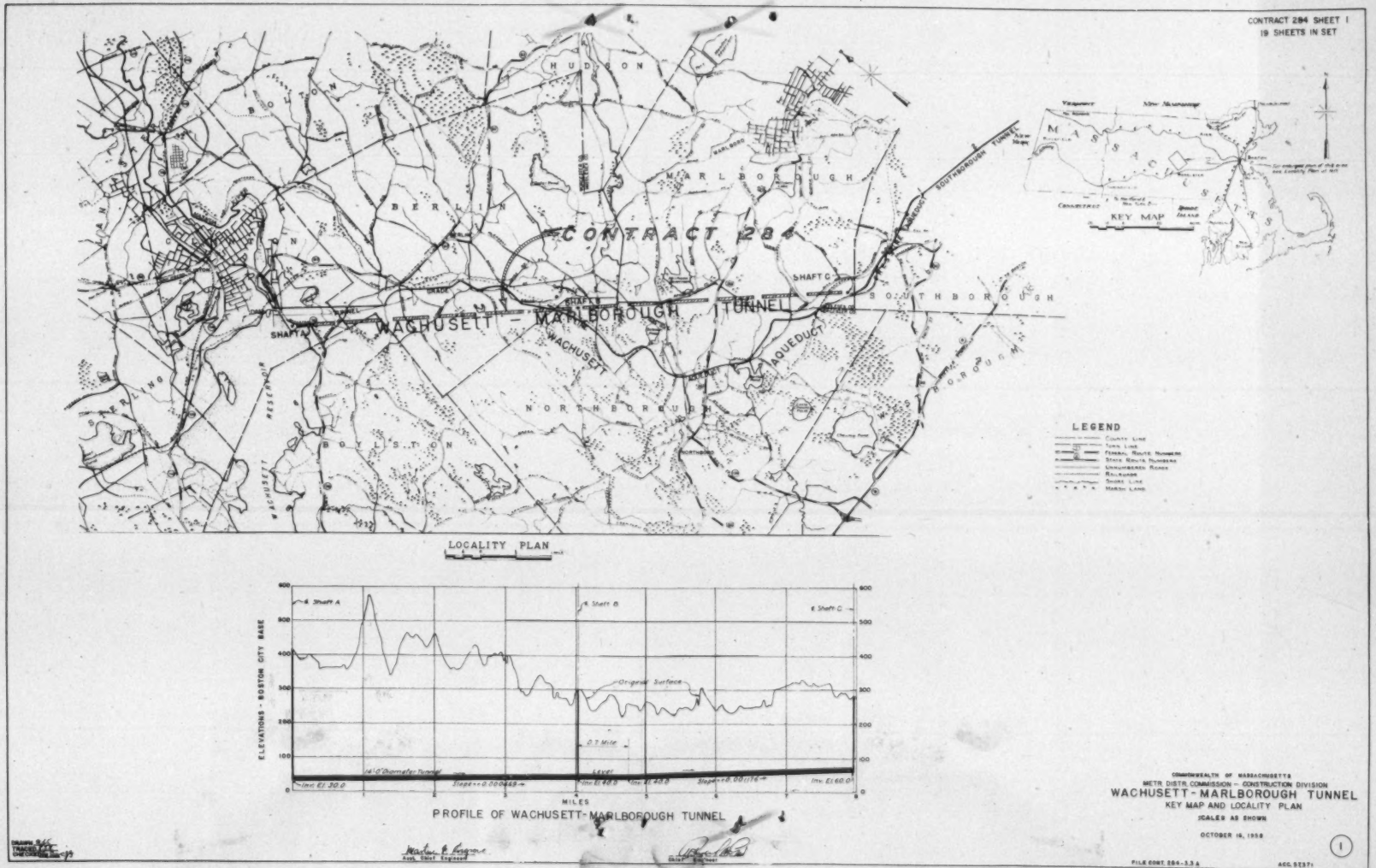

CONTRACT 284 SHEET 1
19 SHEETS IN SET
CONTRACT 284
WACHUSETT - MARLBOROUGH TUNNEL
WACHUSETT AQUEDUCT
SOUTHBOROUGH TUNNEL
SHAFT A
SHAFT B
SHAFT C
HUDSON
BOLTON
BERLIN
MARLBOROUGH
NORTHBOROUGH
BOYLSTON
STERLING
SOUTHBOROUGH
WACHUSETT RESERVOIR
KEY MAP
LEGEND
LOCALITY PLAN
ELEVATIONS - BOSTON CITY BASE
Original Surface
0.7 Mile
14'-0" Diameter Tunnel
Level
MILES
PROFILE OF WACHUSETT-MARLBOROUGH TUNNEL
COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. COMMISSION - CONSTRUCTION DIVISION
WACHUSETT - MARLBOROUGH TUNNEL
KEY MAP AND LOCALITY PLAN
SCALES AS SHOWN
OCTOBER 16, 1958
FILE CONT. 284-3.3 A
ACC. 57371
1

FIG. 4.

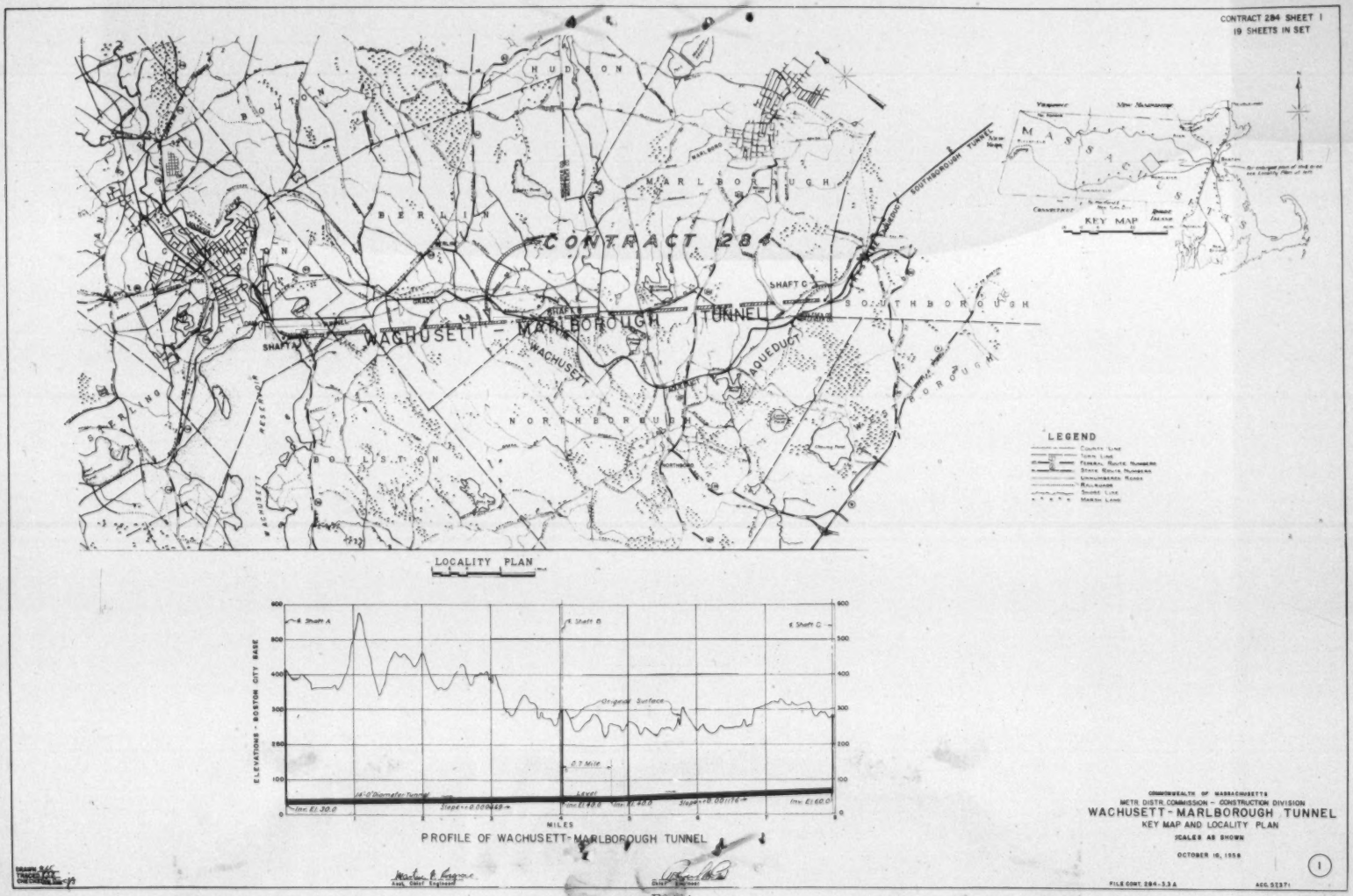

CONTRACT 284 SHEET 1
19 SHEETS IN SET
HUDSON
BOLTON
BERLIN
MARLBOROUGH
CONTRACT 284
SHAFT C
SOUTHBOROUGH
WACHUSETT - MARLBOROUGH TUNNEL
WACHUSETT AQUEDUCT
SHAFT A
NORTHBOROUGH
BOYLSTON
WACHUSETT RESERVOIR
SOUTHBOROUGH TUNNEL
KEY MAP
LEGEND
LOCALITY PLAN
ELEVATIONS - BOSTON CITY BASE
Original Surface
0.7 Mile
Level
MILES
PROFILE OF WACHUSETT-MARLBOROUGH TUNNEL
COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. COMMISSION - CONSTRUCTION DIVISION
WACHUSETT - MARLBOROUGH TUNNEL
KEY MAP AND LOCALITY PLAN
SCALES AS SHOWN
OCTOBER 16, 1958
1
FILE CONT. 284-3.3 A
ACC. 57371

FIG. 4.

In 1956, Chapter 685 authorized the Metropolitan District Commission to construct a pressure aqueduct or water tunnel from Wachusett Reservoir, southeasterly, to connect with the existing pressure aqueduct. A contract for the construction of the Wachusett-Marlborough Tunnel was prepared, and work thereon has been started.

First-Stage Construction

The first stage of construction provides for building three 14-foot-diameter shafts lined with concrete; Shaft A at the upstream end of the tunnel; Shaft B at about the midpoint, and Shaft C at the downstream end, together with the construction of a 14-foot tunnel lined with concrete 42,000 ft in length (see Fig. 4).

The easterly end of the tunnel will be on land owned by the M.D.C. adjacent to both the existing pressure aqueduct and the open channel of Wachusett Aqueduct forebay. A connection to the existing pressure aqueduct will be made, and this more or less governed the general location of the downstream tunnel shaft. The upstream shaft will be located on the east shore of Wachusett Reservoir, also on land of the M.D.C. The central shaft, Shaft B, will be located on land for which a taking was made in fee. A sub-surface easement, 50 ft in width, was taken along the tunnel line, as tunnel construction will not require this area to be occupied.

Preliminary studies involving a consideration of the construction of a cut-and-cover pressure aqueduct as compared to a deep-rock tunnel required a survey of the area in which either type of construction might be located, and an aerial survey was made in January and February, 1957, along the proposed line, covering a width of about 1½ miles. Topographic maps on a scale of 1 in. to 200 ft, showing contours at 5-foot intervals, were furnished along the line, and maps on a scale of 1 in. to 40 ft, with 2-foot contours, were furnished at shaft sites where more details were needed. This was the case at Shaft B, where the final selection of the shaft location was made to best satisfy the requirements of elevation for a future spillway; area for disposal of tunnel spoil; accessibility from existing road; drain-

age; railroad sidings; and proximity to electric power in large quantities. Detailed field surveys at the shaft sites were also made as required.

Traverses were run from established Massachusetts Geological Survey points and accurate coordinates determined for the shafts.

Establishment of the final tunnel-line location on the ground was made from high points near Shafts A and C by means of mirror reflections of the sun during the day and target lights at night for backsights. Bilby Towers were erected and used in locating Shaft B on the line and for locating other points. In all these operations portable radio telephones were used by the field parties.

Shaft Details

Shaft A will be 385 ft deep, lined with concrete for most of its length (see Fig. 5). A portion of the upper part of the shaft will not be lined with concrete under the first stage of the construction, since an underground power plant may later be built to connect with the shaft in this area. The rock will be gunited, if necessary, as a protection against weathering during the interval between first- and second-stage construction. A double pump sump will be built at the bottom of the shaft for use if the tunnel is unwatered in the future.

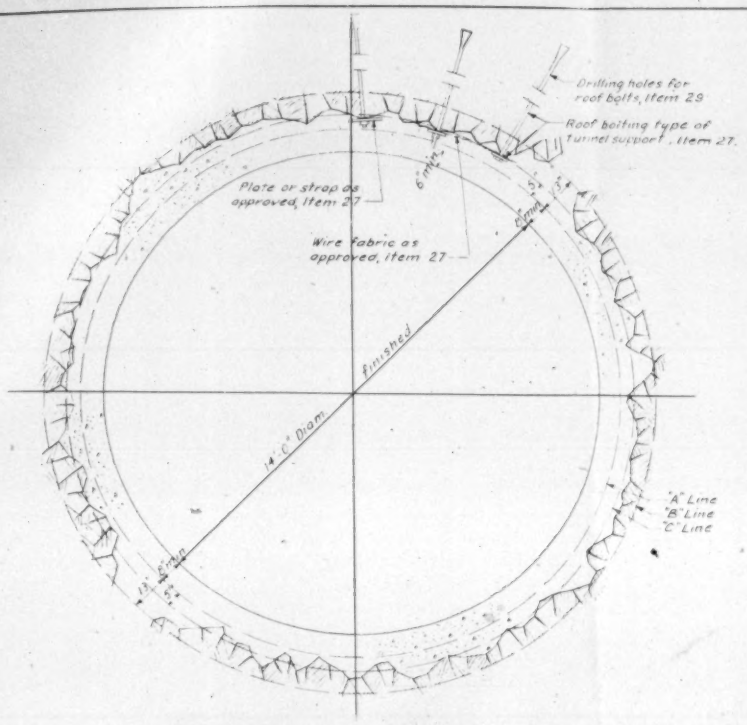
Second-stage construction will also be carried on at Shaft B, to provide an emergency spillway at the top. This shaft, lined with concrete, will be 260 ft deep.

The easterly shaft, Shaft C, will be 223 ft deep, lined with concrete nearly to the top. The future connection to the existing aqueduct will require some additional rock excavation, and this section of the shaft will be gunited if the nature of the rock so requires.

Access to the tunnel in the future, if it is unwatered, will be easier at this shaft than at either Shaft B or Shaft A.

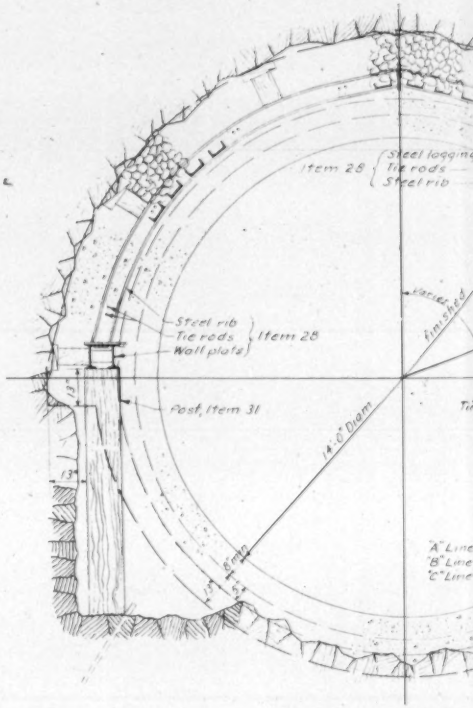
Tunnel Details

For the tunnel construction six conditions of ground or rock character are indicated, and the supported sections proposed to meet these conditions are detailed (see Fig. 6). The


Drilling holes for roof bolts, Item 29
Roof bolting type of Tunnel support, Item 27.
Plate or strap as approved, Item 27
Wire fabric as approved, Item 27
finished
14'-0" Diam
"A" Line
"B" Line
"C" Line

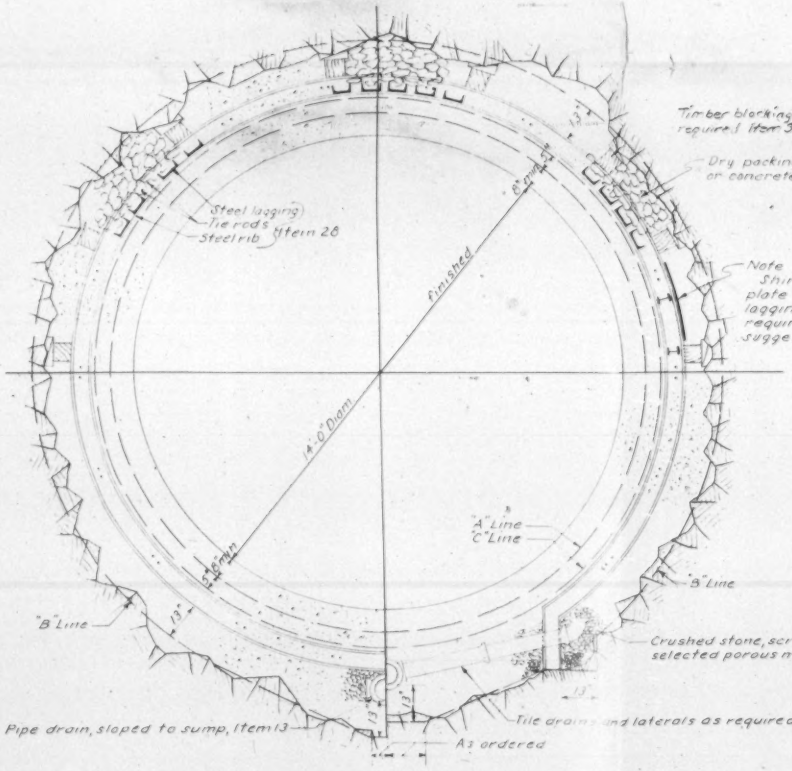
UNSUPPORTED ROOF BOLT SUPPORTED

CIRCULAR



TYPE 1

STEEL SUPPORTI



Note
Shingled steel plate or liner plate construction with lighter lagging may be permitted or required in lieu of the design suggested.

TYPE 3

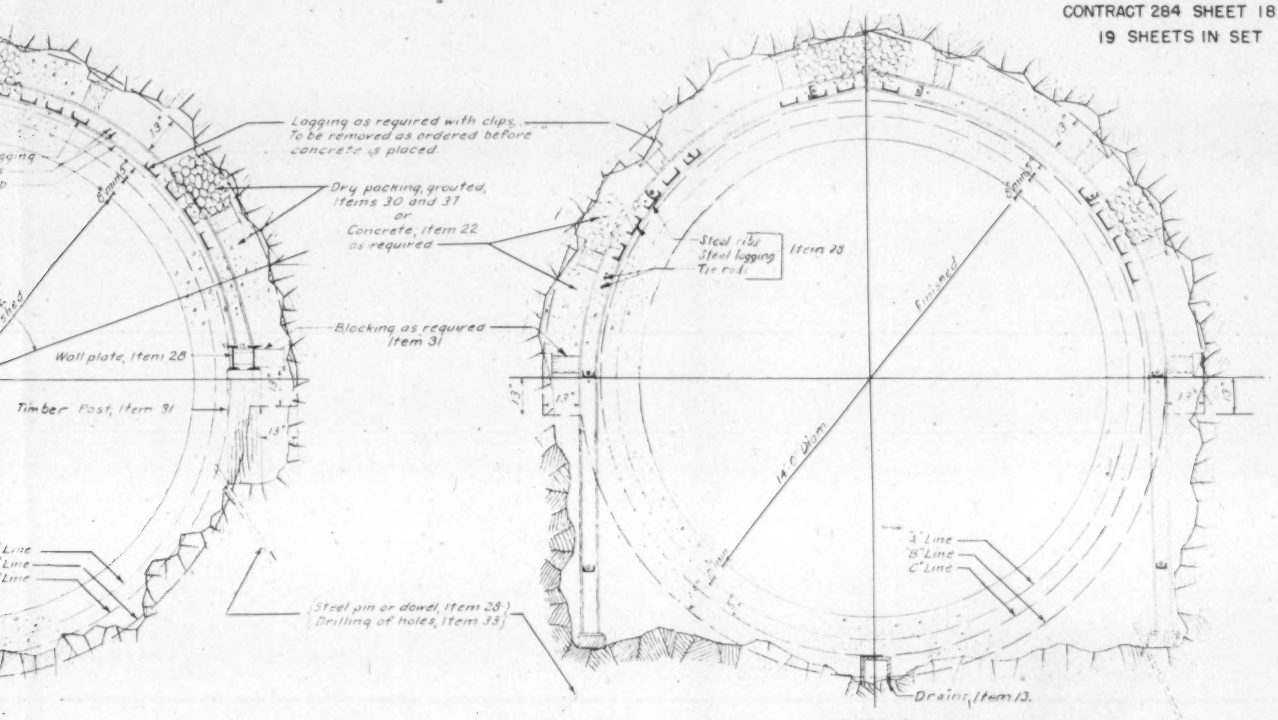
ESTIMATED QUA
TUNNEL SECTIO

DESCRIPTION	IN TO
ROOF BOLT SUPPORTED	
STEEL SUPPORTED TYPE 1	
STEEL SUPPORTED TYPE 2	
STEEL LINED AND SUPPORTED INVERT SUPPORTED – TYPE 3	
STEEL LINED AND SUPPORTED INVERT UNSUPPORTED – TYPE 3	

* Actual quantities
See Section 4 of specificati
for adequacy of support

DESCRIPTION
CIRCULAR UNSUPPOR

Net in


Lagging as required with clips. To be removed as ordered before concrete is placed.
Dry packing, grouted, Items 30 and 31 or Concrete, Item 22 as required
Steel ribs, Steel lagging, Tie rods, Item 28
Blocking as required Item 31
Wall plate, Item 28
Timber Post, Item 31
Finished
14'-0" Diam.
'A' Line
'B' Line
'C' Line
(Steel pin or dowel, Item 28.) (Drilling of holes, Item 33.)
Drains, Item 13.

TYPE 2
STEEL SUPPORTED

ORTED

QUANTITIES FOR VARIOUS TYPICAL
CTIONS PER LINEAR FOOT OF TUNNEL

	INCHES TO 'A' LINE	APPROXIMATE QUANTITIES TO "B" LINE EXCAVATION CU. YDS.	CONCRETE CU. YDS.	DRY PACKING CU. YDS.	PER TIMBER M F B.M	STEEL SUPPORT LBS.
	8	8.908	3.207	——	——	23.80
	8	10.187	3.372	1.114	0.032	486.90
	8	10.178	3.363	1.114	——	552.2
	8	11.364	4.549	1.114	——	698.08
	8	11.385	4.570	1.114	——	634.60

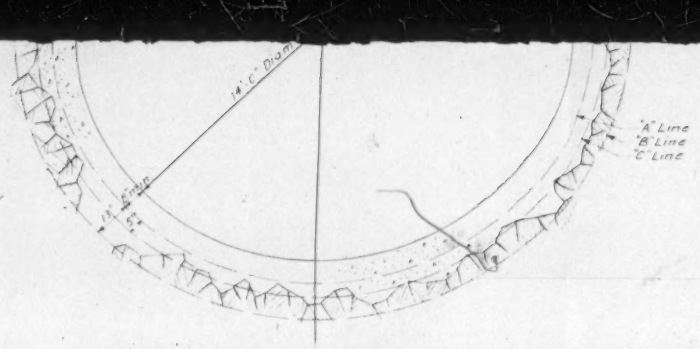
ties may vary materially from the figures tabulated
cations, Article X as to responsibility of the Contractor

ON	INCHES TO 'A' LINE	QUANTITIES TO "B" LINE AREA SQ. FT.	EXCAVATION CU. YDS.	CONCRETE CU. YDS.
PPORTED	8	240.528	8.908	3.207

t inside area (14'-0" Diam) 153.938 sq ft

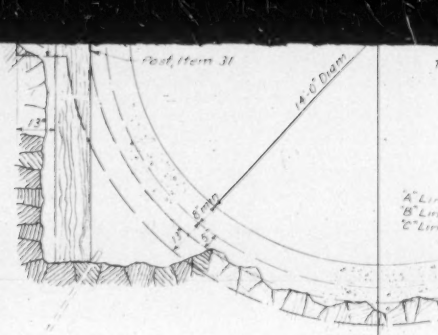
Notes:
Gunite, not shown on these typical sections may be applied over areas of the tunnel rock roof and sidewalls as required by specifications under Item 38 to prevent disintegration and slabbing of rock before lining is placed.
No tunnel excavation will be ordered for less than 6" to 'A' Line, but greater than 6" may be ordered for the whole or any part of tunnel periphery at certain required locations.
Structural steel support, Item 28.

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. COMMISSION — CONSTRUCTION DIVISION
WACHUSETT-MARLBOROUGH TUNNEL
TYPICAL TUNNEL SECTIONS



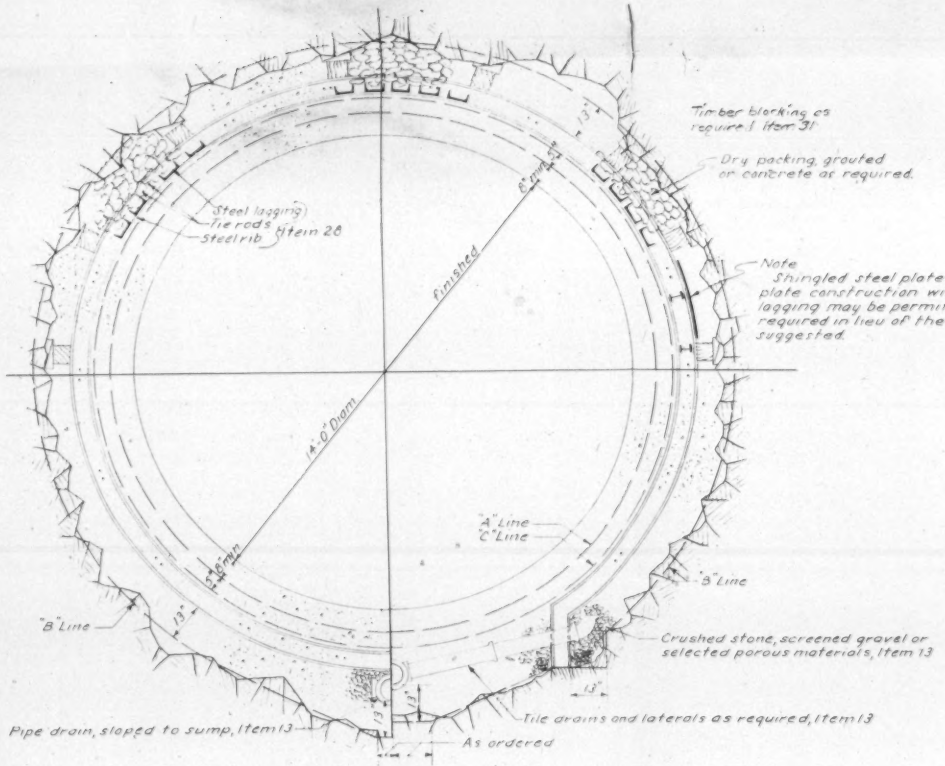
UNSUPPORTED ROOF BOLT SUPPORTED

CIRCULAR



TYPE 1

STEEL SUPPORT


Timber blocking as required, Item 31
Dry packing, grouted or concrete as required
Steel lagging
Tie rods
Steel rib, Item 28
finished
14'-0" Diam
Note
Shingled steel plate or liner plate construction with lighter lagging may be permitted or required in lieu of the design suggested.
"A" Line
"C" Line
"B" Line
"B" Line
Crushed stone, screened gravel or selected porous materials, Item 13
Pipe drain, sloped to sump, Item 13
Tile drains and laterals as required, Item 13
As ordered

TYPE 3

INVERT SUPPORTED INVERT UNSUPPORTED

STEEL LINED AND SUPPORTED

ESTIMATED Q
TUNNEL SECTI

DESCRIPTION	
ROOF BOLT SUPPORTED	
STEEL SUPPORTED TYPE 1	
STEEL SUPPORTED TYPE 2	
STEEL LINED AND SUPPORTED INVERT SUPPORTED – TYPE 3	
STEEL LINED AND SUPPORTED INVERT UNSUPPORTED – TYPE 3	

* Actual quantitie
See Section 4 of specifica
for adequacy of support

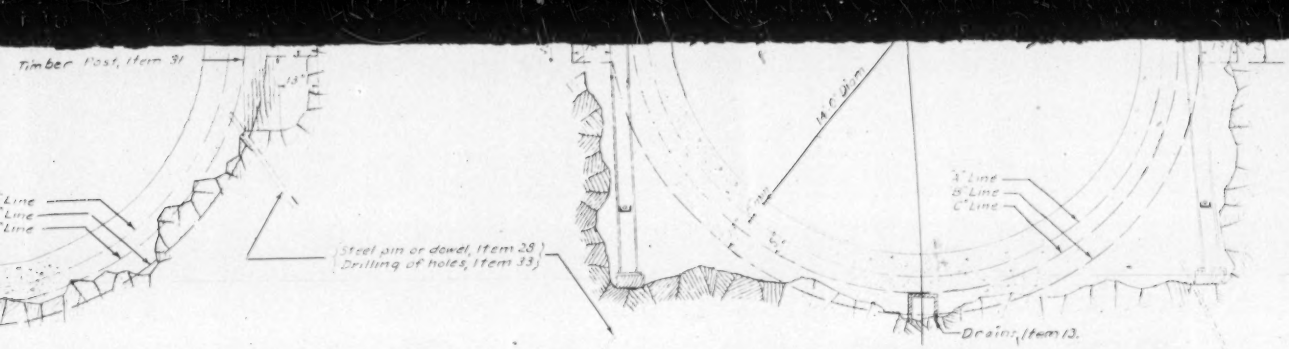
DESCRIPTION
CIRCULAR UNSUPPO

Net i

DRAWN
TRACED
CHECKED

Martin P. Cosgrove
Asst. Chief Engineer

FIG



TYPE 2
STEEL SUPPORTED

ORTED

QUANTITIES FOR VARIOUS TYPICAL
CTIONS PER LINEAR FOOT OF TUNNEL

	INCHES TO "A" LINE	APPROXIMATE QUANTITIES TO "B" LINE				
		EXCAVATION CU. YDS.	CONCRETE CU. YDS.	DRY PACKING CU. YDS	PER TIMBER M F B M	STEEL SUPPORT LBS.
	8	8.908	3.207	———	———	23.80
	8	10.187	3.372	1.114	0.032	486.90
	8	10.178	3.363	1.114	———	552.2
	8	11.364	4.549	1.114	———	698.08
3	8	11.385	4.570	1.114	———	634.60

ities may vary materially from the figures tabulated
ications, Article X as to responsibility of the Contractor
t

TION	INCHES TO "A" LINE	QUANTITIES TO "B" LINE		
		AREA SQ. FT.	EXCAVATION CU. YDS.	CONCRETE CU. YDS.
SUPPORTED	8	240.528	8.908	3.207

et inside area (14'-0" Diam) 153.938 sq ft

Notes:
Gunite not shown on these typical sections may be applied over areas of the tunnel rock roof and sidewalls as required by specifications under Item 38 to prevent disintegration and slabbing off of rock before lining is placed.
No tunnel excavation will be ordered for less than 6" to A" Line, but greater than 6" may be ordered for the whole or any part of tunnel periphery at certain required locations.
Structural steel support, Item 28.

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. COMMISSION — CONSTRUCTION DIVISION
WACHUSETT-MARLBOROUGH TUNNEL
TYPICAL TUNNEL SECTIONS
2 1 0 2 4 FT.
OCTOBER 16, 1958
18

Chief Engineer

FILE CONT. 284-3.3A
ACC. 57388

FIG. 6.

minimum thickness of lining called for is eight inches. Where tunnel support is required, roofbolting or structural steel support will be used, depending upon the character of the rock encountered.

In bad ground full structural ribs might be required, and even the use of liner plates could become necessary. The "B line" shown on each section delimits the earth or rock excavation to be paid for in the shaft and tunnel excavations.

In lining the tunnel, the contractor will be required to place the concrete monolithically over the full cross-section without construction joints. This is done by use of sections of cylindrical forms which can be collapsed and carried through an adjacent section as the concreting proceeds. Usually a sub-invert of concrete is placed along the tunnel before lining is started, to assist in setting the forms to the required grade. The tunnel will operate as a pressure conduit. The natural ground-water level will be above the tunnel pressure gradient over the upstream half of the tunnel length, but will be below the tunnel pressure gradient over most of the distance between Shafts B and C.

The profile for the tunnel was determined principally from a study of the borings made along the proposed line, together with the need to slope the tunnel to minimize the entrapment of air, as well as to provide for unwatering the tunnel by means of pumping at one shaft. Boring data obtained seemed to indicate that in general the character of rock would be favorable for tunnel construction. Deep core borings to the invert grade were made at the shaft sites and at intervals of about 6,000 ft along the line. Shallow borings, extending about 20 ft into bedrock were planned at intervals of about 1,000 ft, with additional holes drilled where more information might be needed. A contract for core borings, involving about 7,000 ft in bedrock, was let in 1957, and 39 holes were drilled along the line.

The rock along the tunnel line is metamorphic and granitic, chiefly the former. Most of the metamorphic rocks are gneisses, possessing foliation that dips steeply—more than 45° in 70% of the holes drilled.

The average recovery in coring operations of 39 holes was

90%, and at the three shafts 98%. This suggests that, in general, the tunnel and shafts are located in good rock. In the area at Shaft A, phyllites were found in certain cores, and shear zones were disclosed. It is presumed that if water is encountered during the excavation of the shafts and tunnel, it may be present at this location.

Joints, irregular fractures, shear zones, and preglacial gorges are present along the tunnel line, but the rock in general is considered good tunnel rock with respect to tunnel driving.

East of Shaft B the rock profile dips to Elevation 154.6 in what appears to be a gorge. It was necessary to make a number of borings in that vicinity, since this location became a controlling one with respect to the tunnel profile. At that location the tunnel arch is located at Elevation 54.0, a distance of 100 ft below the rock surface. The weight of the rock and earth cover at this location exceeds the uplift due to pressure in the tunnel in the order of about 1.3 to 1. Borings also seemed to indicate that there would probably be no excessively wet conditions in the tunnel during construction.

The need for unwatering the tunnel after completion will be remote and infrequent. Previous tunnels built in the system have been provided with complete pumping facilities as part of the permanent construction, consisting of intalled pumps, motors and valves in underground chambers at the low points on the tunnel profile. In this tunnel unwatering will be done at the westerly end near Wachusett Reservoir by means of deep-well-type pumps, which will be installed if and when needed for unwatering. Should such a condition arise after the tunnel has been put in operation, it will, of course, be in the event of a real emergency, and in shutting down the tunnel the supply to the district would be reduced to the amount that can be presently carried through the Wachusett Aqueduct.

In addition to the two sumps provided at the bottom of Shaft A, provisions will be made at the top so that heavy beams, which will be needed for support of the deep-well pumps, can be easily installed.

Unwatering will involve pumping about 49 mil gal from Shaft A; and the size of the pumps to be used for this purpose

can be varied, depending on how long the tunnel can be shut down. It would require about 2½ days to unwater the tunnel if two 7,000-gpm pumps were to be used.

Tunnel Capacity

The amount of water the Wachusett-Marlborough Tunnel should be designed to carry was considered on the basis of the service to be performed in the distant future, though not on the basis of a design period of some specific time, such as 50 or 75 years from the present time. The size of the tunnel was determined from consideration of the sources of supply available or to be available, as well as the District demand in the future.

A study of the future demands of the District indicates that the present sources may be adequate only until 1990, a matter of 32 years in the future. A design period of 32 years for construction of this type is too short; therefore, a capacity determined in connection with the yield of future supplies has been considered.

The safe yield of present sources is considered to be 330 mgd, including 27 mgd from Sudbury Reservoir not generally used because of its poor quality. It has generally been presumed that additional sources would be obtained from the Miller's River, located north of Quabbin Reservoir, where a safe yield of 189 mgd could be developed and brought into Quabbin Reservoir. Although releases required by the War Department regulations from the Quabbin Reservoir would theoretically make a slight reduction in the net safe yield available for water supply, there has been a surplus up to now, and additional storage facilities built on the Connecticut River make it unlikely that the safe yield will be reduced. From estimated safe yields of 189 mgd in the future from the Miller's River, 154 mgd from Quabbin Reservoir, 40 mgd from the Ware River supply, 109 mgd from Wachusett Reservoir, and estimated diversions west of Wachusett Reservoir of about 38 mgd, an estimated safe yield from Wachusett Reservoir under regulated-flow conditions is about 454 mgd. An average discharge of this magnitude during a dry cycle and drawing on Sudbury Reservoir, having a yield of 27 mgd, would satisfy the district demand to about the year 2070. To

satisfy the demand during the maximum hour of a maximum week indicates that the tunnel could be called upon to carry as much as 564 mgd, or even 597 mgd, depending on whether or not the Sudbury supply is used.

The capacity of the tunnel was established on the basis of the estimated yield of future sources rather than on the basis of the demand in the year 2070.

The size of the tunnel was established on the basis of the upper gradients to be permitted and on acceptable velocities.

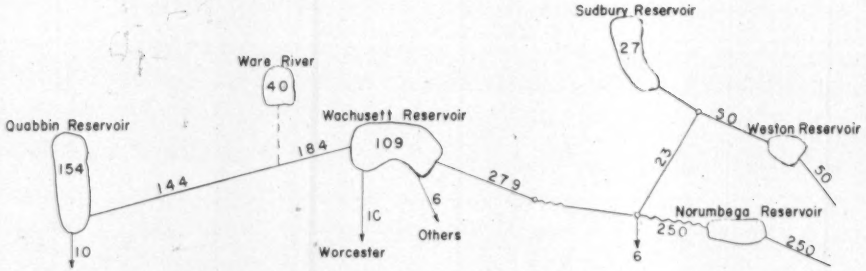
The figure 279 in Table 1 represents the minimum safe-yield flow through the tunnel in 1990, on the assumption of 27 mgd available from the North Sudbury area. North Sudbury water is of poorer quality than that of other sources, and since the yield will exceed the minimum in most years, it is assumed North Sudbury water will not be used except in an emergency and instead, water as available from Wachusett Reservoir will be sent to the District.

Therefore the tunnel flows for 1990 are considered to be 306, 355 and 380 mgd.

In Table 2 the total safe yield in the year 2070 is estimated to be 519 mgd, of which 27 mgd is from the North Sudbury watershed, which yields water of poor quality. Since water available will generally exceed the safe yield, it is assumed that for the ultimate year under consideration the average flow through the tunnel to satisfy the demand would be 454 mgd in a dry cycle, or 481 mgd during a wet cycle. Operating practice would determine whether North Sudbury water should be used or not. The maximum flow in the tunnel would be 597 mgd on this basis.

Shaft Sites

Considerable area is required at the shaft sites for the contractor's use, future construction, or for spoil-disposal areas. As shafts A and C are located on land owned by the Metropolitan District Commission, land takings were not necessary except for an access road at Shaft C. Shafts A and C, however, are located on the shore adjacent to Wachusett Reservoir and the aqueduct forebay, respectively, which are part of the water-supply system, and special sanitary provisions are necessary.

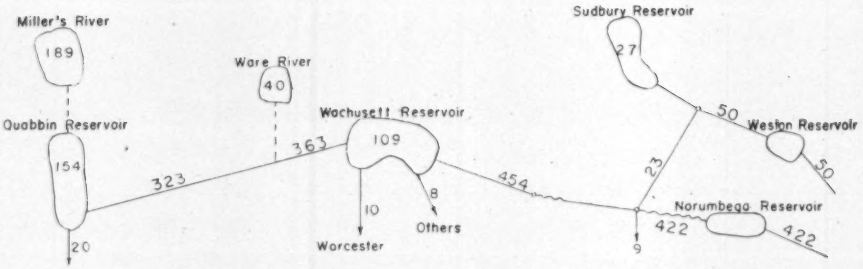


Design Period 32 Years

M.G.D.				
TOTAL QUANTITIES		FLOW IN WACHUSETT TUNNEL		
Average Safe Yield Total Sources	Average Demand In District	Daily Average	Maximum Week +16 %	Maximum Hour +7 %
330	300	* 279	324	346
or				
330	300	306	355	380

* Sudbury yield of 27 m.g.d. used in a dry year.

DESIGN DATA — TABLE I
Flow Pattern for 1990, Safe Yield, mgd



Design Period 112 Years

MGD				
TOTAL QUANTITIES		FLOW IN WACHUSETT TUNNEL		
Average Safe Yield Total Sources	Average Demand In District	Daily Average	Maximum Week +16 %	Maximum Hour +7 %
519	472	* 454	526	564
	or			
		481	558	597

* Sudbury yield of 27 mgd used in a dry year

DESIGN DATA — TABLE 2
Flow Pattern for Total Safe Yield of 519 mgd Year 2070, Miller's River Included

Vol. 19

Drainage from the sites at Shafts A and C, as well as tunnel pumpage, is carried through settling basins and filter beds for the protection of the nearby water supplies, and provision for chlorinating all such drainage and pumpage is required. Thirty-nine acres of land were taken at Shaft B, to provide a spoil-disposal area for 380,000 cu yd of tunnel excavation, and easements were taken on 12 acres of land for access roads and for sanitary purposes. The drainage and tunnel pumpage at this site are carried to a settling basion only, as this procedure is considered sufficient to keep the nearby watercourses free of sediment.

The construction contract requires all tunnel excavation to be carried on from Shaft B, from two headings, and accounts for the 380,000 cu yd of spoil to be disposed of at that location.

Most of the above-ground construction activity will be carried on at Shaft B for the entire life of the contract, and most of the power needed on the work will be required at that shaft or used through that shaft. Three-phase, 60-cycle, alternating-current electricity at 66,000 volts is available close to each of the shaft sites from transmission lines which interconnect with systems of the New England Power Co. and the Boston Edison Co. The Metropolitan District Commission owns these tranmission lines as part of the facilities operated in connection with the existing power plants at Wachusett Dam and at Oakdale. The lines run along the right-of-way of the Old Wachusett Aqueduct, which is within 700 ft of Shaft B. The contractor will be permitted to use these lines as a source of power and may purchase energy from the Metropolitan District Commission at $0.007 per kilowatt-hour. Shaft construction at Shafts A and C is scheduled to free these locations as quickly as possible, in order that work under future contracts at the top of the shafts can be carried on while the tunnel is being driven and lined.

The total time for work of the contract which comprises Stage I of the project is 1,300 consecutive calendar days, or 3.6 years. The progress schedule is based on tunnel driving at a rate of not less than 240 ft per week per heading, and tunnel lining at not less than 900 ft per week per heading.

The contract was awarded to a joint-venture combination

of Perini Corp., Walsh Construction Co. and Morrison-Knudsen Company, Inc., on the bid price of $16,883,011.17, and work will be started shortly.

Some of the significant quantities involved in the construction include:

Tunnel excavation, rock	380,000 cu yd
Concrete lining	135,500 cu yd
Cement	353,700 bbl
Steel support	2,850,000 lb
Roof bolts	60,000 lb
Grout	30,000 cu yd
Drilling holes:	
Roof bolts	21,200 lin ft
Grouting	12,700 lin ft

Second-Stage Construction

The second stage of the project includes work at the tops of each shaft, to provide the connections to the system and the facilities for operation. The designs have not been developed, but the schemes to be used at each shaft are presently being studied. At the top of Shaft C a connection to the existing aqueduct will be made by means of a stub connection, provided for that purpose when the aqueduct was built. Pressure-relief valves are proposed to protect against surge stresses; air-relief valves will be placed at the top of the shafts, and a means of discharging excess water into the adjacent forebay will be provided. This latter arrangement of discharging into the forebay is needed primarily so that a constant amount of water can be run through turbines to be installed at Shaft A for the generation of power, although the demand by the District varies from hour to hour throughout the day. The relatively small size of Norumbega Reservoir and the lack of an adequate overflow spillway at that point have made it desirable to discharge the excess over the demand into the forebay. This excess, however, will flow into Sudbury Reservoir and would be available for use in the low-pressure areas served by Weston Reservoir. As the District demand increases over the years, the likelihood of discharges at Shaft C will cease. Under those conditions some pattern of

flow through the turbines, such as 10% more than the average demand for 16 hours a day and 20% less than the average demand for 8 hours a day, will keep Norumbega Reservoir within narrow operating limits.

At the top of Shaft B an emergency spillway is proposed, which will permit the discharge of water at that location, should controls upstream or downstream fail, or improper operation occur for any reason.

The shaft and the spillway structure will act more or less as a surge tank during operation of the system. Should valves downstream of the tunnel be closed while flow at Shaft A continues, the gradient could continue to rise out of control right up to the elevation of Wachusett Reservoir, which would develop pressures in Southborough Tunnel and along the line in excess of those which are safe. Discharges at Shaft B represent one way to prevent the gradients from exceeding a predetermined amount along the line. Another way will be the use of special controls at Shaft A, which will shut off the flow through the power plant or bypass lines if the turbine tail-water level exceeds a certain elevation. Controls for this purpose will be included in the designs for Shaft A.

At Shaft A considerable work is involved in Stage II of the project, which contemplates the construction of the following facilities:

1. An intake structure at Wachusett Reservoir.
2. An intake tunnel to Shaft A.
3. A power plant.
4. Bypass lines.
5. Operation and maintenance building.

Water from Wachusett Reservoir now enters the distribution system through conduits built in the existing masonry dam and, after passing through the turbines, enters the Wachusett Aqueduct.

It is not intended to use any of the present intake works at the Dam, but instead to construct a separate intake for the new tunnel at a location about 2,000 ft from the Dam on the east end of the Reservoir.

The intake structure proposed may be the tower type, that will provide means of taking water at Elevations 360 and 330, and possibly at levels between these elevations. It is proposed to use sluice gates at the intake ports to shut off the flow, but the control of the flow will be by means of valves in the power-plant structure.

Wachusett Reservoir at Elevation 395.0 provides more head than needed to maintain Norumbega Reservoir and more head than the design pressures used for some pipes, valves and structures already built along the pressure aqueduct. There has never been any plan to connect Wachusett Reservoir to any aqueduct system at an elevation higher than 330, except in the case of early studies of a supply to Lowell and the Merrimack Valley.

Power Plant

The power plant under consideration may be located underground in bedrock, in an excavation to accommodate two turbine-generator installations and bypass lines for use when power is not being generated.

The decision as to whether or not the power plant is located underground will depend principally on the character and quality of rock at that location.

The alternative to this scheme would be that of combining the power-plant installation with the intake structure. Head available for power or to be dissipated when power is not being developed will vary from about 60 to 80 ft. It is expected that the capacity of each of the two generators will be about 2,100 kva. The Metropolitan District Commission has generated power at several points in the system for many years. Power is generated at the present Wachusett Dam, at the east end of the Quabbin Aqueduct where it discharges into Wachusett Reservoir, at Quabbin Dam and at Sudbury Dam. Power is sold to the New England Electric System on a contract basis during 16 hours a day, five days a week, and 7 hours on Saturday, but for some time the need for power has been such that it is being generated 24 hours a day. Presumably similar provisions will be made for the generation and sale of power at Shaft A.

The by-pass lines will be required, to regulate the flow to suit the varying conditions, as well as to control the downstream pressure. Pressure-regulating valves of the needle-valve type are being considered for this service.

The measurement of flow in the various lines will be made by means of either a venturi-type device or the Magnetic Flow Type Meter. It is planned that the system of controls will be such that changes in conditions at Norumbega Reservoir at the downstream end of the pressure line will be indicated at Shaft A, so that releases to the tunnel may be varied as required to accommodate these changes.

The generation of electric power is of secondary consideration in this system, which has as its purpose the function of transporting water for domestic use. Combining this feature with water-supply facilities has worked out well in previous installations, and the indications are that a similar situation will hold in this instance.

The work is being conducted under the supervision of Frederick W. Gow, Chief Engineer of the Construction Division of the Metropolitan District Commission.

STEEL STORAGE-TANK RECONSTRUCTION AT SANFORD, MAINE

BY EMERY S. LITTLEFIELD* AND ROBERT L. MESERVE†

[*Read February 19, 1959.*]

Sanford Water District comprises a system which serves the Town of Sanford, Maine, a community in the southeastern part of the state, with a population of about 15,000. The water supply consists of well fields, treatment plant, pumping station, and emergency surface supply at Littlefield Pond. The distribution system is made up of 16-in. and smaller pipe, with most of the mains 6-in. and 8-in., and an underground concrete distribution reservoir of 750,000-gal capacity.

In 1953, Camp, Dresser & McKee recommended, as a part of an over-all improvement program for the distribution system, the construction of two, new, 750,000-gal covered steel standpipes, one to be located near Littlefield Pond about three miles from the center of Sanford. Prior to that time, in August, 1952, the New England Fire Insurance Rating Association, reporting on the fire-protection facilities of Sanford, had recommended construction of a reservoir in the same vicinity with 1-mil gal capacity.

It recently became possible for the Sanford Water District to obtain this additional storage capacity at a substantial saving, for an existing, 1-mil gal capacity, welded steel storage tank, located in Sanford center, was offered for sale to the District at a sufficiently attractive price to warrant relocating the tank at a new site. This tank was erected in 1946 by the Chicago Bridge & Iron Co. at the site of the Goodall Sanford Mills, which went out of business in 1954. The tank had to be moved to permit other construction, which contributed to the reasonable price at which it was offered. It is 75 ft in diameter and has a height to overflow of 31 ft. The roof plates are supported by several trusses, which extend from the top of the sidewalls

*Superintendent and General Manager, Sanford Water District, Sanford, Me.
†Project Engineer, Camp, Dresser & McKee, 6 Beacon St., Boston 8, Mass.

to a center column support. The structure was originally erected on a concrete ringwall foundation of 18-in. thickness, which enclosed an untreated sand cushion.

This structure was examined in September, and although the inside surfaces were badly peeled and rusted, it was found otherwise to be in satisfactory condition which would justify relocation. The problem confronting the engineers at this point was the choice of the most practical method for removing and relocating the tank. Could it be picked up as a unit and hauled several miles? Or would it be reasonable to remove the roof, make one circumferential cut around the side walls and haul the two great hoops of steel? Due to distance involved and the intricacies in the route of travel to be taken, it was decided that the method most likely to meet with success in transporting the structure was to cut it into several smaller pieces and perhaps risk increased difficulties in reassembly.

In order to insure as far as possible a sound reconstruction program, particular attention was directed toward the formation and required use of a restrictive welding procedure. This procedure included specifications to be followed in cutting up the existing structure in such a manner that the strength of the original welds would be preserved, and so that the shape of the cut sections would be altered as little as possible during the process. Prior to any torch cutting, it was required that the inside of the tank be sand-blasted along the line of each proposed cut. Angle irons were tack-welded to the tank to be used as a guide for cutting. The removal of paint and the use of guide angles resulted in clean, straight cuts with minimum loss of metal. The contractor was required to submit for approval a cutting schedule, showing by sketch the location of proposed cuts with respect to existing seams. Cuts were made parallel to, and in no case closer than 6 in. from, original weldments, except where it was necessary to cut perpendicularly across an existing seam.

All welders to be employed on the project had to submit acceptable procedure and performance test plates prior to the start of the work.

The standpipe walls were cut in two bays about 16 ft high

by 30 ft long. Each lower section of the wall was cut to include a chord across the bottom plates, in order to preserve the integrity of the base joint. These sections, as well as those from other parts of the tank, through careful handling and hauling, maintained their original shape and thereby reduced reconstruction problems to a minimum.

At the new site, a reinforced-concrete ringwall foundation was constructed. The wall was 12 in. thick and approximately 4 ft deep, and was keyed in to a footing basically 16 in. wide and 1 ft deep. Actually, the footing dimensions were greater, since it was poured against undisturbed earth. Within the ringwall, unsuitable foundation material was removed and a 4-in. sand cushion put in place. The sand was first mixed with asphalt in transit-mix trucks, so that a suitable water seal would be provided beneath the standpipe. The original sand cushion was not so treated, but the excellent drainage at that site prevented water contact by capillary action with the underside of the bottom plates. It is not often that an opportunity is presented which permits an examination of the underside of bottom plates. The original protection consisted only of a shop coat of paint, but after 12 years the condition of the surface was such that only repainting was necessary with a minimum of cleaning. Although the underside of the base was in good condition, a complete paint coverage was applied prior to the placing of the plates at the new location.

The welding procedure required that all edges to be welded be prepared by gas cutting or machining (the latter method was used), so that clean, beveled edges would be obtained. The contractor elected to reassemble the entire structure by tack welding to facilitate his work (see Fig. 1). This helped to eliminate the setting up of undue stresses which might otherwise have resulted from drawing joints together after having finished welding adjacent seams. Bottom sections were brought together by taking up on bolts, inserted through lugs welded to the separate pieces. The only difficulty in obtaining a satisfactory reassembly occurred in the roof, where a diverging separation was evident between plates, amounting to about ¾ in. at the center. This was later taken care of very satisfactorily with the placement of 2-in. cover plates over several feet of seam at each joint.

FIG. 1.—STEEL STORAGE TANK AT SANFORD, ME.

The welding specifications called for double-welded butt joints for all horizontal and vertical wall seams, with complete penetration, and back-chipping required before welding from the back side of each weld. Bottom plates were single-welded, with complete penetration assured through the use of 1½-in. by ⅛-in. backing strips. No welding was allowed in extremely cold weather, unless preheating of the parent metal was employed.

Rewelding proceeded intermittently from the early part of December and was completed near the first of February. During the construction period, several new welds were subjected to unannounced radiographic examination. X rays were taken of a total of 11 ft of vertical weldments, or about 3% of the seams subjected to primary stress. Several X rays included the junctions of primary and secondary seams, to determine any weaknesses at those critical areas. Without exception, the radiographs showed the welding to be of excellent quality—that is, free of cracks, gas pockets, inclusions and other possible defects. Further examination before the reservoir is finally put into service will consist of vacuum testing at least a portion of the seams in the bottom plates for leakage.

Work remaining includes sandblasting and repainting the entire structure, which will be accomplished as soon as weather conditions permit. The storage tank will be in service probably by late spring. This addition to the water system of Sanford will have been completed at a saving to the Water District of approximately $16,000 under the cost of a new tank of similar capacity.

General contractor for the project was Gerard Genest of Sanford; welding subcontractor was Lloyd N. White, Inc., of Portland, and welding consultants were J. G. Sylvester Associates of Hingham, Mass.

PROCEEDINGS

Seventy-Seventh Annual Convention

Lake Placid Club, Essex County, New York

September 21-23, 1959

The Seventy-Seventh Annual Convention of the New England Water Works Association was held at the Lake Placid Club, Essex County, N. Y., on September 21-23, 1959.

The technical sessions of the convention were held in the Agora Conference Hall; the Manufacturers' exhibits were located in the rooms adjoining the Agora Conference Hall and the Garth Lounge.

Monday, September 21

Morning Session

President Clarence L. Ahlgren in the Chair.

The Annual Reports of the Secretary, Treasurer, Editor, Membership Committee, Finance Committee, Committee on Scholarship, Committee on Library, Committee on Committees, Committee on Legislation, and Committee on Reciprocal Relations with Institution of Water Engineers were presented and accepted.

The President declared the polls closed and appointed as Tellers of Election Emery S. Littlefield, Lawrence K. Engdahl and G. Arthur Faneuf.

Reports of the following technical committees were presented and accepted: Committee on Water Quality and Treatment, Committee on Specifications for Cast-Iron Pipe and Fittings, Committee on Standardization of Pipe Flanges and Fittings, Committee on Meter Specifications, Committee on Gate Valves for Ordinary Water Works Service, Committee on Deep-Well Vertical Pumps, Committee on Conservation, Development and Utilization of Water Resources, Committee on Plastic Pipes

and Plastic Linings for Water-Supply Uses, Committee on Water-Works Safety Practice, and Committee on Specifications for Prestressed Concrete Water-Storage Tanks. Most of these reports are printed in this issue of the JOURNAL.

Secretary Knox announced the election by the Executive Committee of the following new members: Francis Henry Hunt, Operation Technician, Metropolitan District Water Bureau, Hartford, Conn.; Willard White Harris, Superintendent, Water Department, Marblehead, Mass.; Gordon L. Kirjassoff, Consulting Engineer (Edwards & Kelcey), Boston, Mass.; John D. Marr, Jr., Project Engineer, Metcalf & Eddy, Boston, Mass.; Dudley S. Richards, Commissioner, Water Board, Fairhaven, Mass.; Worthen H. Taylor, Chief Engineer, Massachusetts Department of Public Health, Newbury, Mass.; Arthur L. Whitten, Board of Water Commissioners, Braintree, Mass.

Afternoon Session

A paper on "Contamination of Ground Water by Synthetic Detergents" was presented by I. Laird Newell, President, Henry Souther Engineering Co., Hartford, Conn., and Frederick O. A. Almquist, Principal Sanitary Engineer, State Department of Health, Hartford, Conn.

A paper on "Bangor's New Upland Pond Supply" was presented by Donald B. Johnson, Superintendent, Water District, Bangor, Me.

Evening

A Carnival Square Dance was held in the Agora Conference Hall under the personal direction of "Charlie" Baldwin, compliments of the Water and Sewage Works Manufacturers Association.

TUESDAY, SEPTEMBER 22

Morning Session

This session was devoted to a Superintendents' Symposium on "Suburban Growing Pains." Paul F. Howard was Moderator, and the speakers were as follows: Walter G. Clark, Burlington, Mass.; Thomas F. Coughlin, Wellesley, Mass.; Canfield S. Dickie, Pittsfield, Mass.; Lawrence K. Engdahl, Milton,

Mass.; Philip W. Hammond, Holden, Mass.; Clifton E. Hodgdon, Lynnfield Center, Mass.; John A. McGonnell, Lynnfield, Mass., and Rogert G. Oakman, Needham, Mass.

Evening

"A Reealy Beeg Shew" with top-notch professionals was given in the Agora Conference Hall, compliments of the New England Water Works Association.

WEDNESDAY, SEPTEMBER 23

Morning Session

A paper on "Development of Ground-Water Supplies for Brunswick and Topsham Water District" was presented by E. Boyd Livesay, Superintendent, Brunswick-Topsham Water District, Brunswick, Me.

A paper on "Conservation of Water Resources by Pollution Control" was presented by Sylvan C. Martin, Regional Engineer, U.S. Public Health Service, New York, N. Y.

A Panel Discussion took place on the subject of "Location of Hydrants under Present-Day Highway Conditions," participated in by Kenneth W. Robie, Brookline, Mass., J. Porter Hennings, Portland, Me., and Roger G. Oakman, Needham, Mass.

Afternoon Session

A paper on "Burlington Water Quality and Treatment-Plant Operation" was presented by Edward L. Tracy, Chief, Bureau of Environmental Sanitation, State Department of Health, Burlington, Vt.

A paper on "A Pilot Plant for Water Treatment and Its Operation at Middleton Pond, Massachusetts," prepared by William P. Davis, Sanitary Engineer, Amarillo, Tex., and Hyman J. Steinhurst, Associate Sanitary Engineer, Massachusetts Department of Public Health, Boston, Mass., was read by Mr. Davis, now employed by Texas Department of Public Health, assigned to the Amarillo Bi-City-County Health Unit.

A paper on "Vacuum-Type Diatomite Filters in Water Treatment" was presented by Henry N. Armbrust, Project Engineer, B-I-F Industries, Inc., Providence, R. I.

Evening Session

A Social Hour was held in Agora Conference Hall, followed by a Banquet served in Forest East Suites Dining Room, both functions with the compliments of the Water and Sewage Works Manufacturers Association.

President Ahlgren introduced the chairman of the Awards Committee, Dr. Donald R. F. Harleman.

AWARD OF THE DEXTER BRACKETT MEMORIAL MEDAL

DONALD R. F. HARLEMAN. Mr. Ahlgren, distinguished guests and members of the New England Water Works Association.

In 1916, as most of you know, the New England Water Works Association established the Dexter Brackett Memorial Medal in honor of a man who for many years was chief of the Metropolitan Water Board in Boston, and who was also a past president of this Association and editor of its JOURNAL for many years.

The Committee on Awards this year consists of William D. Monie, who is Chief Engineer of the Portland Water District, Harry P. Loftus, Superintendent of the Water and Sewer Commission of the city of Marlborough, Mass., and myself.

A few days ago I received in the mail a new book which was entitled "A History of Hydraulics." This book traces the history of the utilization and control of water through some 2,000 years up to the present time. In connection with tonight's meeting there was one particular thing I looked for in this book—one significant fact—and that was that in the 2,000 years of the history of the use and control of water apparently women have contributed absolutely nothing.

But tonight I am happy to say that this is no longer true, because it gives me a great deal of pleasure to announce that the Committee, for the first time in the history of this Association, has chosen to present the Dexter Brackett Memorial Medal —which is given for the most meritorious paper in the JOURNAL of the New England Water Works Association in 1958—to a woman. Her name is Mrs. Barbara Hawkes, and her paper was entitled "Performance of the Billerica Water Treatment Plant." I would like to ask Mrs. Hawkes to come forward. [*Applause.*]

Mrs. Hawkes, it gives me a great deal of pleasure to present the Dexter Brackett Memorial Medal to you on behalf of the New England Water Works Association for your paper. [*Applause.*]

MRS. BARBARA HAWKES. Thank you very much. I thank everybody. [*Applause.*]

DR. HARLEMAN. I hope the new edition of the "History of Hydraulics" will record this fact.

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COMMEMORATIVE AWARD

DONALD R. F. HARLEMAN. The Commemorative Award was established in 1949 for the paper judged the next in merit published in the JOURNAL in the year 1958. This year the Commemorative Award is given in memory of Leonard Metcalf. Mr. Metcalf was particularly interested, as most of you know, in all phases of water supply, development and operation. He was the author of many technical books and contributed several papers to the New England Water Works JOURNAL. He was elected a member of this Association in 1897 and was president in 1915. He was made an honorary member in 1925, which was the year prior to his passing.

The Commemorative Award this year is given to Father Daniel Linehan for his paper entitled "The Geohydrology of New England." Unfortunately, Father Linehan is unable to be here because of a very definite prior commitment of a lecture tour, for which he is so well known. Nevertheless, I think that we should recognize his contribution to the field and give him an ovation. [*Applause.*]

PRESIDENT AHLGREN. Thank you very much, Dr. Harleman.

* * * *

It is my pleasure now to present the Twenty-five Year Award Certificates of the Association. As you know, these are awarded to those who have served their communities continuously for 25 years and have been members of this Association for the same number of years. Unfortunately, two of the three recipients are unable to be here tonight, but their Certificates have been mailed to them. The one man whom we do have the pleasure of meeting and awarding this certificate to is Thomas J. Boland, Commissioner of Water Department, Southborough, Mass. Will Mr. Boland please come forward? [*Applause.*]

This is a real preasure for me, as one of my duties. I only hope that the citizens of your own town think as much of you as we do. [*Applause.*]

MR. BOLAND. Thank you very much. [*Applause.*]

PRESIDENT AHLGREN. The other two recipients are Florence E. Driscoll, Registrar at Haverhill, Mass., and Maurice A. Libby, Superintendent at Bath, Me. [*Applause.*]

The next is a very special pleasure for me, of presenting an Honorary Membership to a man who not only has been a member of this Association but has contributed a tremendous amount to it and to the field he is in. He is one of the eminent hydraulic engineers of the country, formerly Chief Engineer of the Construction Division, Metropolitan District Commission in Boston, who then moved away to the New York Board of Water Supply and is now engaged as Consultant to that board. We have a great deal of respect for this man as an engineer among the top men of the country, but I think equally as much respect for him as a gentleman, as an outstanding bass, as I remember, in Boston a few years ago when he and his quartet sang "Mr. Bones," a generous giver to our Scholarship Fund, a man who has encouraged young men in his profession, which I think is one of the most important things a man can do.

I think you all know to whom I am referring—Karl R. Kennison. [*Applause.*]

Karl, it is a real pleasure for me to present this Honorary Membership to you. I would like to have you just say a few words to this Association that you have been a member of so long—37 years in fact. You were president in 1945 and you received the Dexter Brackett Memorial Medal in 1934. It is a real pleasure to present this Honorary Membership Certificate to you.

KARL R. KENNISON. President Ahlgren, and all my many good friends here: I have had many a nice thing happen to me but this is about the best. It is very much appreciated, and principally because it comes from those whom I prize as my friends.

I have learned over many years that in the evaluation of assets, my best assets are my friends, and I have a great many in the New England Water Works Association. Recognition of friends is not something that requires a lot of words or explanation.

Only last Wednesday morning a neighbor of mine called and knocked on my door. Her name is Cindy, and she is six years old. She had in one chubby little fist a bunch of short-stemmed chrysanthemums that she had broken off the tops of her plants, and she simply handed them to me and said, "This is for you." It was very much appreciated, and this is very much appreciated. Thank you very much. [*Applause.*]

PRESIDENT AHLGREN. I would like next to call on a former president of this Association, now Chairman of the Scholarship Committee, for a report on the activities of that Committee, and for the action they may have taken this year. Will Bill Duffy come forward, please?

WILLIAM B. DUFFY. President Ahlgren, members of the New England Water Works Association, ladies and gentlemen:

Contributions in the amount of $2,025.00 up to August 31, 1959, the end of the fiscal year, increased the Scholarship Fund to $12,638.80 towards the goal of a $25,000 Scholarship Fund. The amount of interest earned by the Fund which may be used for scholarship loans or grants is $363.08. The Scholarship Committee has awarded the second New England Water Works Association Scholarship grant of $300 to Alan E. Ferry, a junior member of the Association. He is a resident of Manchester, N. H., and has worked during the last two summers with the Division of Sanitary Engineering of the New Hampshire Department of Health. He is a student at the Massachusetts Institute of Technology and the son of Clarence E. Ferry, Superintendent of Distribution of the Manchester Water Works. The Scholarship Committee thanks all contributors for their support and urges members of all classes to give their financial assistance to the Scholarship Program.

Respectfully submitted, William B. Duffy, *Chairman,* Thomas R. Camp, *Vice-Chairman,* Richard M. Cleveland, *Secretary,* William P. Melley, *Treasurer,* Richard N. Berry, Roger W. Esty and Kenneth F. Knowlton.

I thank you. [*Applause.*]

PRESIDENTIAL ADDRESS

By Clarence L. Ahlgren

They say there are two things you can be sure of—death and taxes. There is a third, a presidential address of the man who has presided during the year. I have had a lot of suggestions, of course, as to the length of the address, what I should say, and so forth, but in the process of determining just what should be said in the presidential address of 1959 I thought I probably should read through one or two of the previous addresses. Therefore I started in, and actually I became so interested that I read through 25 years of addresses, and I probably would have gone through a few more if I had had the time.

I was really quite impressed by what the other past-presidents have said. The presentations ranged from whimsical to serious. They were concerned with problems within the Association and problems of a national and international scope.

I think I would just like to sum up a little bit what the past-presidents of the Association have said to us.

First, they have in essence said to us to keep our Association growing by bringing in new members. You have done that, to the extent that Lake Placid or the coming Prudential Center in Boston are about the only accommodations that can handle the large attendance at our annual meetings, and only one of these is in New England. Possibly there might be two.

The second point that they have made is that it is important to strive continually for good public relations in this waterworks field. A year or two ago—more maybe—a New England Water Works publicity program was tried for a year on a hired basis. I believe the experience of that was that local publicity is of the greater value. I have heard it mentioned this year that perhaps we should simplify it a little bit, and that may come in the future. One intent behind this publicity program was that it might improve the professional recognition of members in their communities, and indirectly the superintendents' wage

picture, which still is a sad commentary on the evaluation of water-works' worth to our communities.

The third point was made that we need to continue our proud and energetic discharge of our duties, so that we maintain the highest standards of our profession, and so that we attract young men who are equally proud and energetic to our profession. It is possible that one of the weaknesses of our water-works departments is that we cannot attract salarywise, and are not training young men. Just how does your department stack up, and what are you doing about it?

The fourth point in the past-presidents' picture is that there is a continuing need for energetic and imaginative planning, and there is evidence here this week that much is being done, and there is much to do.

The fifth point is that there is need for continually introducing younger men to the committee work of the Association, particularly the technical committees. Perhaps it would not be amiss to invite your stated interest in these committees in the future.

The sixth point was that there is a strong need now for a firm stand and a creative program to protect our interest in the available water supplies from encroachment by recreation and other uses.

The seventh point is that we should broaden our horizon by establishing a scholarship for members and junior members, to encourage them to join and project our profession. This has been done, and I think it is one of the important accomplishments of the Association in thinking beyond itself.

The eighth point is that we should be aware of national programs and actively make our well-qualified views known by discussion and by continued letters to our Congressmen. I am so impressed by the fact that we have 1,150-odd members that I think the impact of the 1,150 people would certainly be felt in Congress.

Down through the 26 years that I have been associated with you I have always been impressed by the fact that you may differ a little bit, but I think in principle you are fairly well united. If that is true, certainly if we exercise our privilege

of writing to our Congressmen, it must carry a lot of weight, which will probably mean a great deal to us and to our families in the future.

Now, I confess that I cannot very well improve on such an inclusive list of programs. They provide a very sound guide for a fine organization.

There is really one point that I want to make, though, and a great deal of the thunder, I think, has been stolen in our meetings that were so well planned by Paul Howard and created so much thinking and discussion. It is probably in the form of a question that I want to present it, and it is this: Are we here in New England producing and disseminating our share of research programs?

After hearing the very excellent papers that we have had presented to us, I feel sure that we are doing a great deal, but when I was thinking about the question I was thinking about the whole gamut, the whole scope of this problem. I gained the impression that much is being done in the towns that never gets reported. I also gained the impression that there are many cities and towns that should be doing some work in the line of treatment of their supplies, simple correction—corrosion, for instance.

New England has long been a source of much sound research, but it is possible that we as superintendents, commissioners, and so forth, can do even a greater part to project this record.

Ken Knowlton raised a point at this afternoon's session that falls in line with what I was going to make as the last point, which is this: Can the Association, through committee work, collect data, evaluate it, correlate it and provide information to departments, or bring out research needs and encourage this area of our work? I think Ken's idea was that a great deal has been excellent, but that it has not been continued long enough. Perhaps this Association can serve through committee work to develop a plan that will guide it through more of a continuing process.

That more or less winds up my serious talk. I can't leave this job, however, without expressing my appreciation to all the

members of this Association for an extremely happy opportunity to act as your president for the past year. It has really been a never-to-be-forgotten experience, particularly because this Association, as I mentioned a short time ago, is composed of the finest group of people that I have ever had the pleasure to work with in any organization. Karl Kennison indicated that was not a provincial opinion, but just to go farther than that I had the pleasure of discussing a paper with three gentlemen from Long Island, who are members of this Association. They make a special effort to come to this Convention every year, and I believe they have been occasionally to a Boston meeting. Their considered reason for this is that they feel that at this Convention they pick up more information than anywhere else. Also they are impressed by the stature of the men in this group, and, as Mr. Risbridger said last year, the women. [*Laughter and applause.*]

The responsibility for that success lies first with your interest, as manifested in your membership in this Association, by your attendance at the meetings, by your willingness to serve on committees, by your readiness to share your experiences in the form of papers presented at the meetings, and by your participation in the round tables and discussions.

The membership of the Association continues to increase slightly. This year approximately 80 new members were added, and about 46 were dropped out or passed on. The attendance at the meetings this year has been the best in the history of the Association. I am sure this is a direct reflection of the outstanding work of the Program Committee under the imaginative direction of Paul Howard, ably assisted by Cliff Hodgdon at the superintendents' sessions, and Laird Newell at the chemists' sessions and their assistants as listed on the program.

Along with the Association I am indebted to the Finance Committee under the leadership of Ed Howard for seeing to it that realistic budgets were presented and passed.

I am especially indebted to the Executive Committee for their steady guidance. I started this job with a little apprehension, but through their good sense of humor and fellowship it has really been an easy job.

Of course you know that two men carry the brunt of this load. One is William P. Melley, who has served this Association as Treasurer since 1945; the other is Mr. New England Water Works himself—Joe Knox. [*Applause.*] The president is apprehensive, but how about Joe? He has his troubles. I certainly have had no better friend than Joe this past year.

Backing up the success of every man there is a woman, and I shall always remember the woman who was radiant and speechless at our convention last year. Do you remember Alice Hathaway? [*Applause.*]

Now, there is a lot that goes into the success of these conferences and conventions, and they attract really an amazing proportion of our membership. I am sure their success is due in very strong part to the very distinctive contribution of the Water & Sewage Works Manufacturers Association, managed by John G. Stewart and presided over by Edward Alt this year. I think they deserve a big hand. [*Applause.*]

I think it is only fair to point out that a good friend and member of this Association serves as their treasurer—Reg Hayes. [*Applause.*]

And this year for the first time I really got acquainted with John's assistant, who adds a pleasantness to our conventions—Dorothy Dimmers, his secretary. [*Applause.*]

I really can't get by without saying that I have had a very pleasant couple of meetings with their vice-president, George Kelsey, who has been a good sport and has a sense of humor. [*Applause.*]

Now, there are a lot of things which really mean a lot to this convention, but I think there are two people who have really put time in, and they are probably nervous, too, about all the favors, and so forth. They are the Chairmen of the Program Committees. This year we have had, first, Mrs. Warren Gentner, who has been Chairman of the Ladies' Program Committee. [*Applause.*]

Then we have had Whitney K. Stearns, Chairman of the Water & Sewage Works Manufacturers Association Entertainment Committee for the men. I think his wife did all the work. [*Laughter.*]

Finally, we are indebted to all others who served on committees, particularly those who labored on technical committees, which produced the working data and standards for the Association.

I just want to add my sincere thanks to all of you for making this year a memorable one and a successful one. I thank you. [*Applause.*]

* * *

PRESIDENT AHLGREN. This is the time that we ask for the report of the Tellers, and I will now ask the Chairman of that committee, Emery S. Littlefield, to come forward and tell us how the vote ran.

EMERY S. LITTLEFIELD. Mr. President, the Report of the Tellers of Election is as follows:

REPORT OF THE TELLERS OF ELECTION

September 23, 1959

Total number of votes cast	391
FOR PRESIDENT: Warren A. Gentner	384
FOR VICE-PRESIDENT: Peter C. Karalekas	385
FOR DIRECTOR: Harold B. Scales	382
FOR TREASURER: William P. Melley	385

Respectfully submitted,

EMERY S. LITTLEFIELD, *Chairman*
G. ARTHUR FANEUF
LAWRENCE K. ENGDAHL

PRESIDENT AHLGREN. Thank you very much. I hereby declare the slate elected as read. [*Applause.*]

I would now like to introduce to you, if he is on this side of the hall, our new Director, Harold Scales from Portland. Is he here? [*Mr. Scales stands; applause.*]

Now it is my real pleasure to present your new President, who has been with the Board of Water Commissioners in the City of Hartford since 1921, which is 38 years. He has been Chief Engineer since 1948. He is a recipient of a 25-year award here, at least three years ago, and this year has been a real

friend in all of my duties and work here. It is a great pleasure to present to you Warren A. Gentner, your new President. [*Applause.*]

President Warren A. Gentner in the Chair.

PRESIDENT GENTNER. Thank you, Clarence. Ladies and gentlemen, members of the New England Water Works Association: I must confess to a sense of great relief on hearing the Report of the Tellers; it would be very difficult for me to tell you exactly how I feel at this moment. I am deeply grateful. I do appreciate very much the honor which you have conferred upon me by electing me to the presidency of this Association for the coming year, and I think you will understand if I just say "Thank you very, very much." [*Applause.*]

One of the first official duties of a new president is a very pleasant one, involving, as it does, the presentation of the Past-President's Certificate to the outgoing President. It is a pleasure, and a very great pleasure, for me to present to you, Clarence, this certificate, the Past-President's Certificate, and to congratulate you on the noteworthy success you had as President of this Association during the past year. [*Handing certificate; applause.*]

I am asked to remind you, in case it be necessary, that dancing follows immediately upon the conclusion of this meeting.

Before we break up I would like to leave this thought with you: This has been a highly successful convention. As we go to our homes tomorrow we shall carry with us many happy memories of the last few days. Let us keep them happy memories. Let us drive carefully and not hurry too much.

Now, my second official duty is, without objection, to declare this, the 77th Convention of the New England Water Works Association, officially adjourned.

ANNUAL REPORT OF THE SECRETARY

August 31, 1959

Mr. President, and Members of the New England Water Works Association:

The Secretary herewith submits the following report of the changes in the membership during the past fiscal year, and the general condition of the Association.

The present membership is 1,149 constituted as follows: 14 Honorary Members, 937 Members, 2 Junior Members, 154 Associates and 42 Corporates.

MEMBERSHIP

				Total
September 1, 1958—Honorary Members		14		
Withdrawals:				
Died	1	1	13	
Elected:				
June 18, 1959			1	14
September 1, 1958—Members, total		918		
Withdrawals:				
Died	20			
Dropped	9			
Resigned	17	46	872	
Elections:				
September 14, 1958	11			
October 23, 1958	10			
November 20, 1958	3			
December 18, 1958	3			
January 15, 1959	3			
February 19, 1959	9			
March 19, 1959	5			
April 16, 1959	3			
May 21, 1959	1			
June 18, 1959	8			
August 20, 1959	9		65	937

September 1, 1958—Junior Members, total		1		
Election:				
February 19, 1959	1	1		2
September 1, 1958—Associates, total		155		
Withdrawals:				
Dropped	2			
Resigned	7	9	144	
Elections:				
September 14, 1958	2			
November 20, 1958	1			
December 18, 1958	1			
January 15, 1959	1			
February 19, 1959	1			
March 19, 1959	2			
June 18, 1959	1			
August 20, 1959	1		10	154
September 1, 1958—Corporates, total		37		
Elections:				
October 23, 1958	1			
December 18, 1958	1			
February 19, 1959	1			
March 19, 1959	1			
August 20, 1959	1	5		42
Total Membership, September 1, 1959				1,149
Total Membership, September 1, 1958				1,124
Gain of				25

ELECTIONS

Members

September 14, 1958—V. Walter Adams, Robert B. Boyd, Jr., Robert G. Holzmacher, Edward F. Huntington, William P. Jenkins, Samuel C. McLendon, Alfred A. Melien, Jr., John M. Murray, Marion A. Packard, Jr., Lawrence W. Raymond, Norris I. Stephens. (11)

October 23, 1958—Walter Armory, Ernest H. Atwood, Thomas W. Conlon, Joseph B. Conners, Robert F. Dunning, Solomon N. Gay, Adrien G. Guertin, Myles F. Howard, Carl H. Marhoffer, Francis E. Savard. (10)

November 20, 1958—Robert E. Barry, James S. Mulroy, John J. Russell. (3)

December 18, 1958—Edward E. Begin, William A. Magoon, John J. Mahoney. (3)

January 15, 1959—Tracy I. Flagg, Neal B. Mitchell, Lewis W. Soule. (3)

February 19, 1959—Victor M. Arrighi, Henry W. Buck, Edward P. Egan, Jr., Edward Forrest, John P. Keon, William J. McGurl, Robert E. McQuade, Paul H. Obear, Jr., Charles E. Wheeler. (9)
Junior Member: Alan E. Ferry. (1)

March 19, 1959—John P. Bargnesi, Paul L. Joyce, Sylvan C. Martin, Robert L. Meserve, Francis A. Riani. (5)

April 16, 1959—Maurice H. Burr, Leonard R. Grimes, Louis L. Morse. (3)

May 21, 1959—Walter C. Anderson. (1)

June 18, 1959—William B. Davis, Alton E. Garland, J. Nelson Harger, John J. Holden, Earle S. King, Vincent J. O'Leary, Edward E. Shapleigh, Jr., Harry N. Wyman. (8)

August 20, 1959—Laurence H. Ferris, Thomas L. Huddy, John J. McKinnon, Joseph A. Novaro, Raymond A. Ouellette, James Robertson, Alfred W. Sawyer, Robert S. Wharton. (8)
Re-instated: H. Russell Medding, Jr. (1)

Associate Members

September 14, 1958—The Bristol Company, DeLaval Steam Turbine Company. (2)

November 20, 1958—Eastern Survey and Engineering Company, Inc. (1)

December 18, 1958—Cutler-Hammer, Inc. (1)

January 15, 1959—Mercer Marine. (1)

February 19, 1959—New England Chemical Supply Corporation. (1)

March 19, 1959—Adams Pipe Repair Products, The E. H. Carroll Company. (2)

June 18, 1959—Wilbur and Williams Company, Inc. (1)

August 20, 1959—A. Y. McDonald Mfg. Company. (1)

Corporate Members

October 23, 1958—Plainview Water District, N. Y. (1)

December 18, 1958—West Springfield Board of Water Commissioners. (1)

February 19, 1959—Vermont Water Conservation Board. (1)

March 19, 1959—Laboratorio de Aguas. I.N.O.S., Caracas. (1)

August 20, 1959—South Farmingdale Water District, N. Y. (1)

Withdrawals

Members

Died—John A. Andrew, Robinson D. Buck, Daniel W. Cole, Albert C. Dickerman, G. Gale Dixon, Frank Emerson, Robert W. Glasheen, Theodore W. Grindle, Robert A. Harrington, H. O. Lacount, Myrl R. Limeburner, Chester A. Moore, Edwin T. McDowell, Edward V. O'Donnell, Edmund T. Roach, E. Locke Robinson, Thomas E. Sears, Edgar P. Snow, Frank F. Wells, Arthur D. Weston. (20)

Resigned—Clarence R. Day, Joseph H. DeFoe, Wilbur H. Dewey, Samuel E. Eldridge, Harry M. Freeburn, Alexander Good, Frederick W. Gow, Dr. J. R. Hurtado, F. Alan Livingstone, Harold H. Marshall, John S. B. Morrison, Edgar W. Nickerson, Charles E. Renn, Arthur B. Stiles, Charles F. Whitman, Jr., Henry M. Wilkins, Irving W. Whittle. (17)

Dropped—Theodore M. Beach, Sterling G. Brisbin, Martin F. Finnegan, George E. Hawkins, George C. Kiefer, Jr., Charles Nagy, Jamil A. Nasir, Robert C. Thompson, William D. Twombly. (9)

Associates

Resigned—Crane Company, Jenkins Brothers, National Lead Company, N.E. Pump and Machinery Co., Simplex Wire and Cable Company, Turbine Equipment Company of N.E., C. R. Swaney Company. (7)

Dropped—General Electric Company, Pittsburgh Tank and Tower Company. (2)

Receipts for the Fiscal Year Sept. 1, 1958, to Aug. 31, 1959

Entrance fees	$ 285.00
Dues, members of all grades	10,617.50
Interest	467.41
Advertising	6,453.00
Subscriptions	758.88
Sales of Journals	58.94
Membership certificates	76.00
Membership lists	1.25
Convention registration fees	2,973.00
	$21,690.98
Less: Withholding Taxes	134.27
	$21,556.71

There is due the Association:

Dues	214.50
Advertising	40.00
	$ 254.50

Respectfully submitted,

Joseph C. Knox, *Secretary*

ANNUAL REPORT OF THE TREASURER

Boston, September 3, 1959

To William P. Melley, Treasurer
New England Water Works Association
Boston, Massachusetts

We have examined the statement of assets and funds and the statement of cash receipts and disbursements of the general fund and the scholarship fund of the New England Water Works Association for the year ended August 31, 1959. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

We traced all recorded receipts into the depositary banks, verified the general fund bank account and petty cash fund and the scholarship fund bank account as at August 31, 1959, and examined properly approved vouchers for all disbursements. On September 2, 1959 we examined the paid-up cooperative bank shares at the First National Bank of Boston, and we verified by direct communication the cash on deposit in savings banks.

In our opinion, the accompanying statement of assets and funds and the note thereon and the related statement of cash receipts and disbursements of the general fund and the scholarship fund present fairly the financial position of the New England Water Works Association at August 31, 1959, and the recorded cash receipts and disbursements for the year then ended, on a cash basis consistent with that of the preceding year.

(*Signed*) SCOVELL, WELLINGTON, & COMPANY

STATEMENT OF ASSETS AND FUNDS (Exhibit A)

As at August 31, 1959

Assets

Invested funds assets			
Cash in savings banks			
Boston Five Cents Savings Bank	$ 5,716.80		
Provident Institution for Savings	5,762.59	$11,479.39	
Securities			
Braintree Co-operative Bank, 5 paid-up shares	$ 1,000.00		
Sandwich Co-operative Bank, 10 paid-up shares	2,000.00	3,000.00	$14,479.39
General fund assets			
Cash, First National Bank of Boston		$ 7,476.04	
In office		50.00	
		$ 7,526.04	
Furniture and fixtures		1,180.00	8,706.04
Scholarship fund asset			
Cash, Milton Co-operative Bank			12,638.80
			$35,824.23

Funds

Invested funds			$14,479.39
General fund			
Balance, August 31, 1958		$ 7,964.81	
Excess of receipts over disbursements, Exhibit B		741.23	
Balance, August 31, 1959			8,706.04
Scholarship fund, Exhibit B			12,638.80
			$35,824.23

Note: The statement above, prepared on a cash basis, includes dues received in advance, $6,870, and employees' withholding taxes, $291.17. It does not reflect the following:

Accounts receivable, dues	$214.50
Due on account of advertising	40.00
	$254.50

No depreciation has been taken on furniture and fixtures.

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS (Exhibit B)

For the Year ended August 31, 1959

General Fund

Receipts (exclusive of dues received in advance and employees' withholding taxes)			
Initiation fees		$ 285.00	
Dues, 1958-1959 and prior years		3,747.50	
Convention registration fees		2,415 00	
Interest		467.41	
From publication of Journal			
Advertisements	$6,453.00		
Subscriptions	758.88		
Sale of Journal	58.94	7,270.82	
Miscellaneous			
Membership certificates	$76.00		
Membership lists	1.25	77.25	
Total receipts			$14,262.98
Disbursements			
Publication of JOURNAL			
Printing	$5,726.34		
Reporting	199.70		
Stationery and postage	333.81		
Editor's salary	750.00		
Sundry	76.44	$ 7,086.29	
General and administrative			
Salaries	$5,464.00		
Certificates of membership	58.52		
Printing, postage and stationery	162.97		
Office supplies and expense	611.86		
Office rent	1,260.00		
Electricity	94.94		
Telephone and telegraph	293.58		
Auditing	125.00		
Social security taxes	195.53		
Fidelity bond	93.75		
Sundry	372.84	8,732.99	
Brought forward		$15,819.28	$14,262.98

Disbursements (continued)			
Meetings and committees			
Water works school	$ 125.00		
Printing, postage and stationery	1,584.17		
Convention expense	911.92		
Dinners	1,165.14		
Contribution to June conference	200.00		
Scholarship fund expenses	48.75		
Sundry	329.50	4,364.48	
Interest added to savings bank deposits		364.89	
Total disbursements			20,548.65
Excess of disbursements over receipts (exclusive of dues received in advance and employees' withholding taxes for current year)			($6,285.67)
Dues received in advance		$6,870.00	
Employees' withholding taxes			
Receipts for current year	$291.17		
Less Payments for prior year	134.27	156.90	7,026.90
Excess of receipts over disbursements, Exhibit A			$741.23
Balance, general cash, August 31, 1958			6,784.81
Balance, general cash, August 31, 1959			
Represented by			
Cash in First National Bank of Boston		$7,476.04	
Cash in office		50.00	
			$7,526.04
Scholarship Fund			
Balance, scholarship cash, August 31, 1958			$10,550.72
Receipts			
Contributions		$2,025.00	
Interest		363.08	2,388.08
			$12,938.80
Disbursements—scholarship			300.00
Balance, scholarship cash, August 31, 1959			
Represented by cash in Milton Co-operative Bank, Exhibit A			$12,638.80

ANNUAL REPORT OF THE EDITOR

To the New England Water Works Association:

The Editor submits herewith his report for the year ending August 31, 1959. The financial figures, tabulated in the report, are derived from the report of the Treasurer, which contains a detailed statement of the receipts and disbursements on account of the September and December, 1958, and March and June, 1959, issues of the JOURNAL.

In Table 1 is presented a statement of the material contained in the four issues of the JOURNAL for the past year, while in Table 2 is given a comparison of the JOURNAL for the past year with those for preceding years.

TABLE 1.—STATEMENT OF MATERIAL IN SEPTEMBER AND DECEMBER, 1958, AND MARCH AND JUNE, 1959, ISSUES OF THE JOURNAL OF THE NEW ENGLAND WATER WORKS ASSOCIATION

		Number of pages								
		Papers	Proceedings	Total text	Index	Advertisements	Cover and contents	Insert plates	Total pages	Total cuts (number)
Sept.,	1958	111	2	113	0	49	4	2	168	18
Dec.,	1958	19	69	88	9	47	4	0	148	0
Mar.,	1959	105	5	110	0	45	4	3	162	24
June,	1959	99	2	101	0	49	4	1	155	15
Total		334	78	412	9	190	16	6	633	57

Size. The four issues contained 633 pages, of which 412 were text.

Cost. The gross cost of the JOURNAL was $7,086.29, equivalent to $6.24 per member; the surplus was $184.53, equivalent to $0.16 per member.

Reprints. Reprints of papers have been furnished to authors at cost.

TABLE 2.—COMPARISON OF JOURNALS OF THE NEW ENGLAND WATER WORKS ASSOCIATION
Four Issues for Fiscal Year Ending August 31

	1950[1]	1951[2]	1952[3]	1953[4]	1954[5]	1955[6]	1956[7]	1957[8]	1958[9]	1959
Average edition (copies printed)	1,250	1,300	1,390	1,420	1,442	1,476	1,495	1,498	1,578	1,609
Average membership	921	957	1,017	1,057	1,077	1,089	1,106	1,110	1,114	1,137
Circulation at end of year	1,172	1,240	1,283	1,331	1,334	1,357	1,387	1,427	1,421	1,446
Pages of text	440	423	463	421	436	442	457	418	473	412
Pages of text per 1,000 members	477	442	456	398	405	406	413	376	424	363
Total pages, all kinds	666	703	671	635	652	655	674	626	689	633
Total pages per 1,000 members	723	734	660	601	606	602	610	564	618	557
Gross Cost:										
Total	$5,240.51	$6,069.62	$5,423.98	$5,865.67	$6,108.76	$5,898.97	$7,060.88	$6,842.20	$7,287.51	$7,086.29
Per copy	1.05	1.17	0.98	1.03	1.06	1.00	1.18	1.14	1.15	1.10
Per page	7.86	8.64	8.08	9.23	9.37	9.02	10.48	10.91	10.57	11.19
Per member	5.69	6.34	5.34	5.55	5.68	5.42	6.38	6.16	6.53	6.24
Per member per 1,000 pages	8.55	9.02	7.96	8.75	8.71	8.28	9.46	9.85	9.48	9.86
Per member per 1,000 pages of text	12.92	14.99	11.52	13.19	13.03	12.25	13.92	14.72	13.80	15.12
Surplus:										
Total	$1,294.73	$ 351.34	$1,040.76	$ 500.97	$ 513.89	$ 101.11	$ 588.09*	$ 224.26*	$ 701.67*	$ 184.53
Per copy	0.26	0.07	0.19	0.09	0.09	0.02	0.10*	0.04*	0.11*	0.03
Per page	1.94	0.50	1.55	0.79	0.79	0.15	0.87*	0.36*	1.02*	0.29
Per member	1.41	0.37	1.02	0.47	0.48	0.09	0.53*	0.20*	0.63*	0.16
Per member per 1,000 pages	2.12	0.53	1.52	0.74	0.73	0.14	0.79*	0.32*	0.91*	0.25
Per member per 1,000 pages of text	3.20	0.88	2.20	1.12	1.10	0.20	1.16*	0.48*	1.33*	0.39

[1] Including 25 pages of standard specifications.
[2] Including comprehensive index, 1882 to 1950.
[3] Including 16 pages of standard specifications.
[4] Including 87 pages of standard specifications and recommended practice.
[5] Including 71 pages of standard specifications and recommended practice.
[6] Including 8 pages of standard specifications.
[7] Including 27 pages of standard specifications.
[8] Including 47 pages of standard specifications.
[9] Including 28 pages of standard specifications.
* Net cost.

Circulation. The present circulation of the JOURNAL is:

Members, all grades	1,149
Subscribers	199
Exchanges	29
Advertisers	69
Total	1,446

JOURNALS have been sent to all subscribers and to advertisers.

Respectfully submitted,

(*Signed*) GEORGE C. HOUSER, *Editor*

REPORT OF MEMBERSHIP COMMITTEE

September 18, 1959

To the New England Water Works Association:

We are pleased to report that the Association had a net gain of 25 members over last year.

The following figures give the membership of the past two years:

As of Sept. 1, 1958		*As of Sept. 1, 1959*	
Members	932	Members	953
Associates	155	Associates	154
Corporates	37	Corporates	42
	1,124		1,149

Gain of 25

1959

Losses:			*Elections:*	
Members:			Members	64
Resigned	17		Junior Members	1
Died	20		Associates	10
Dropped	9	46	Corporates	5
Associates:				80
Resigned	7			
Dropped	2	9		
Corporates:				
Resigned	0	0		
		55		

Respectfully submitted,

JOHN J. BAFFA
DONALD C. CALDERWOOD
EDWIN T. MCDOWELL
(*Deceased*)
FRANCIS J. O'BRIEN
EDGAR P. SNOW
RICHARD S. WOODHULL

(*Signed*) GEORGE W. COFFIN, *Chairman*

REPORT OF THE FINANCE COMMITTEE

August 31, 1959

To the Executive Committee of the
New England Water Works Association:

The Finance Committee herewith submits its report on the budget for the year 1958-59, and its recommended budget for the year 1959-60.

The Committee has examined the figures obtained from the records of the Association during the past year, and has consulted with the Treasurer concerning revenue and disbursements for the coming year.

The following tabulation is the estimated and the actual budget for the past year:

REVENUE FOR 1958-59

	Budget	*Actual*
Entrance fees	$ 200.00	$ 285.00
Dues	11,000.00	10,617.50
Interest	450.00	467.41
Advertising	5,600.00	6,453.00
Other Journal receipts	750.00	817.82
Registration fees	3,000.00	2,973.00
Miscellaneous	50.00	77.25
	$21,050.00	$21,690.98
Less: Withholding Taxes		134.27
Total adjusted income		$21,556.71

DISBURSEMENTS FOR 1958-59

	Budget	*Actual*
General and Administrative	$ 8,850.00	$ 8,441.82
Journal	7,700.00	7,086.29
Meetings and Committees	3,750.00	3,798.34*
Net expense of luncheons	1,000.00	1,124.14*
Contingencies	750.00	
	$22,050.00	$20,450.59

The items starred exceeded the budget, and as voted by the Executive Committee, a transfer from Contingencies to these items was made.

The deficit for the year was estimated at $1,000, but the year closed with a surplus of $1,106.12, due largely to the increase in advertising revenue and the fact that operating expenses were held to a minimum.

The invested funds of the Association are $14,479.39.

The following budget is recommended for the year 1959-60:

REVENUE	
Entrance fees	$ 250.00
Dues	10,750.00
Interest	450.00
Advertising	5,800.00
Other Journal receipts	750.00
Registration fees	2,750.00
Miscellaneous	50.00
	$20,800.00
DISBURSEMENTS	
General and Administrative	$ 8,600.00
Journal	8,000.00
Meetings and Committees	4,000.00
Net expense of luncheons	700.00
Contingencies	700.00
Membership lists	1,000.00
	$23,000.00

This budget anticipates a deficit of $2,200—$1,000 of which is for the printing of the membership lists which occurs every five years. The deficit, if actually incurred, will be met from the available cash of the Association.

We refer you to the Treasurer's report, which includes the report of the auditors, Scovell, Wellington & Co., for further financial details and to the Secretary's report for changes in the membership.

Respectfully submitted,

(*Signed*) EDWIN M. HOWARD, *Chairman*
JAMES W. REILLY
GLEN S. WEEKS

REPORT OF THE SCHOLARSHIP COMMITTEE

To the New England Water Works Association:

Contributions in the amount of $2,025.00 up to August 31, 1959, the end of our fiscal year, increased the Scholarship Fund to $12,638.80 towards the goal of a $25,000 Scholarship Fund. The amount of interest earned by the Fund which may be used for Scholarship loans or grants is $363.08. The first Scholarship grant of $300 was made a year ago at our Seventy-sixth Annual Convention at Poland Spring, Me., to Frank A. Wyskiel, a Junior Member of the Association. He is a resident of Manchester, N. H., and worked during the summer of 1957 for the Manchester Water Works. He is a student in the course of Sanitary Engineering at Cornell University, Ithaca, N. Y. The Scholarship Committee thanks all contributors for their support and urges members of all classes to give their financial assistance to the Scholarship Program. A list of the contributors to the Scholarship Fund follows.

Respectfully submitted,

(*Signed*) WILLIAM B. DUFFY, *Chairman*
THOMAS R. CAMP, *Vice-Chairman*
RICHARD M. CLEVELAND, *Secretary*
WILLIAM P. MELLEY, *Treasurer*
RICHARD N. BERRY
ROGER W. ESTY
KENNETH F. KNOWLTON

CONTRIBUTORS TO THE NEWWA SCHOLARSHIP FUND

Aldrich, Ellwood H.
Ahlgren, Clarence L.
Almquist, Frederick O. A.
Arnold, Walter A.
Barnhill, Kenneth G.
Bengle, Victor N.
Blackmer, James W.
Bogren, George G.
Brown, Robert E.
Burke, Roland F.
Burlingame, Roland S.
Camp, Thomas R.
Capaldi, Edward F. (2)
Carrington, Mayo
Chase, E. Sherman (3)
Cianca, Oscar
Clark, Thomas W.
Classon, W. Guy
Cleveland, Richard M.
Clifford, John C.
Cobb, Edwin B.
Coffin, George W.
Cole, Daniel W. (2)
Colton, William R.

Coughlin, Thomas F.
Crabtree, Henry G.
Craven, Thomas T.
Dresser, Herman G.
Duffy, John H.
Duffy, William B.
Eaton, Bruce P.
Emerson, Frank
Erickson, Ernest E.
Esty, Roger W.
Fair, Gordon M.
Fay, Spofford & Thorndike, Inc.
Ferry, Clarence E.
Flood, Frank L.
Fox, Benjamin E.
Frank, James A. (2)
Fuller, Charles E.
Gage, Willard L.
Gavett, Weston (2)
Gay, George F.
Gaynor, Lester
Gentleman, Lawrence M.
Gentner, Warren A.
Gifford, Allan T.
Glidden, A. Leland
Graf, August V. (2)
Griswold, Harold W.
Grossman, Richard P.
Haley, F. W.
Hazeltine, Stephen
Hazen & Sawyer, Engineers
Hirsh, Philip R.
Hoad, William C.
Hodgdon, Clifton E. (3)
Houser, George C. (2)
Howard, Edwin M.
Howard, Paul F.
Hughes, Henry F.
Hunt, Henry J.
Jackson, Norman E.
Jacobson, Samuel
Jordan, Harry E.
Kennison, Karl R. (2)
Killam, Elson T.
Knowlton, Kenneth F.
Knox, Joseph C.
Lamprey, Gerald H.
Lawler, Joseph C., Jr.
Learned, Albert P.
Libby, Arthur C.
Loftus, Harry P.
Manganaro, Charles A.
Mansfield, Myron G.
Marston, Frank A.
Matera, James J.
McCarthy, Joseph A.
McDonald, A. H.
Mebus, George B.
Melley, William P.
Miller, David W.
Minkus, Alexander J.
Moore, Edward W.
Mountain, Albert E.
Naylor, William
Newell, I. Laird
Oakman, Roger G.
O'Hanlon, Joseph
O'Reilly, John S.
Pazziani, Paul
Penniman, Frederick G.
Reed, Clarence H.
Richards, John V.
Rockwell, Col. Willard F.
Root, Darrell A.
Russell, Vernon C.
Sampson, George A.
Scott, Walter M.
Shaw, Arthur L.
Shaw, Percy A.
Smith & Norrington, Engineers
Stearns, Whitney K.
Sullivan, William F.
Symonds, Allen M.
Symons, George E.
Thomas, Ariel A.
Tracy, Edward L.
Turnbull, Francis J.
Turner, Howard M.
Van Geenhoven, Harry
Veatch, N. T.
Walker, Kenneth H.
Wheeler, Robert C. (2)
White, Ralph H.
Wolfe, Thomas F.

CONTRIBUTORS TO THE NEWWA SCHOLARSHIP FUND (*Continued*)

Bristol, Connecticut, City of
Biddeford & Saco Water Company
Bristol County Water Company
Connecticut Water Works Association
Consumers Water Company
Dedham Water Company
Division of Sanitary Engineering, Maine State Dept. of Health
Greenwich Water Company
Grafton Water Company
Hampton Water Company
Hingham Water Company
Maine Water Utilities Association
Massachusetts Waterworks Association
Massachusetts Water Works Company
Milford Water Company
Mystic Valley Water Company
New Canaan Water Company
New Hampshire Water Works Association
Noroton Water Company
Oxford Water Company
Salisbury Water Supply Company
Southbridge Water Supply Company
Torrington Water Company
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Dresser Manufacturing Division
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Foxboro Company, The (2)
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Neptune Meter Company
Parsons Company, W. B.
Pitometer Associates, The (2)
Pollard Company, Inc., Joseph G.
Prescott & Sons, H. R.
Red Hed Manufacturing Company (3)
Roberts Filter Manufacturing Company
Shahmoon Industries, Inc.
Smith-Blair, Inc.
Smith Manufacturing Company, The A. P.
Torrington Supply Company
White Construction Company, R. H. (2)
Wood Company, R. D.
Worthington Corporation — Gamon Meter Div.

(List as of October 26, 1959)

REPORT OF COMMITTEE ON LIBRARY

August 31, 1959

To the New England Water Works Association:

The Library Committee is pleased to submit its report for the year ending August 31, 1959.

There is available in the Association Library, which is located at the New England Water Works Association office at 73 Tremont St., Boston, Mass., a complete bound file of the New England Water Association Journal from 1882 to date. There are, however, numerous requests from all over the world for certain issues of the JOURNAL that are out of print. The Committee would like to take this opportunity to publish the following list of issues of the JOURNAL that are not available for distribution and respectfully request the membership to search their own library for any of these issues which could be spared for use by the Association.

March	1900	June	1930
March-June	1903	Mar.-Dec.	1934
June	1904	Sept.-Dec.	1935
Sept.	1905	June	1936
Sept.-Dec.	1906	June	1937
Mar.-Sept.	1907	Mar.-Sept.	1938
Sept.	1914	June-Sept.	1939
Dec.	1920	June	1940
Dec.	1921	June	1941
March	1922	Dec.	1943
Dec.	1923	Sept.-Dec.	1945
June	1927	March	1947
March	1928	March	1950

In the instance where two months, such as March-June, March-Sept., are listed it means the issues of those months are needed and not inclusive.

Also available are bound volumes of the Journal of the American Water Works Association from 1920 to date and transactions of British Institution of Water Works Engineers from 1901 to date.

The Library Committee recommends that serious consideration be given to the purchasing of a copying machine which would be used to fulfill requests for articles from JOURNALS that are out of print but which are preserved in bound volumes in the Library. A nominal fee could be charged for this reproduction service which would help amortize the cost of the machine. The reproductive facilities would also be available for general use in the New England Water Works Association Office which is an integral part of the Library.

The Reference Section of the Library contains many textbooks and engineering handbooks of particular interest to personnel in the water works profession. While new books have been purchased from time to time in the past, no program has been instituted for an annual procurement of books. The Library Committee, therefore, recommends that the approximate sum of $35.00 be made available each year for the purchase of books to supplement and update the Reference Section. After reviewing the books now on hand, the Committee recommends the purchase of the following books for the ensuing year:

Name	Publisher	Author	Price
1. Environmental Sanitation	Wiley	Salvato	($12.00)
2. Pump Selection and Application	McGraw Hill	Hicks	($ 9.50)
3. Handbook of Hydraulics, 5th Edition	McGraw Hill	King	($10.00)

The Committee believes that facilities of the Library would be more beneficial to members of the Association if books could be withdrawn for reference. Therefore, with the assistance of Mrs. Hathaway, who has graciously consented to undertake the responsibility of Librarian, a trial program will be initiated, whereby members will be allowed to borrow certain reference books from the Library, with a time limit being imposed.

Respectfully submitted,

SYDNEY C. BEANE, *Chairman*
PAUL C. ROSS
JAMES V. TURNER

REPORT OF THE COMMITTEE ON COMMITTEES

August 31, 1959

To the New England Water Works Association:

At a meeting on August 20, 1959, the Committee on Committees, which is composed of the members of the Executive Committee, studied the questionnaires returned by the chairmen of the various technical committees regarding the status of their work. As a result of the information in the questionnaires the Committee on Committees recommends that all technical committees of the Association be continued as follows:

NEWWA

8 Committee on Legislation
9 Committee on Reciprocal Relations with the Institution of Water Engineers (London)
11 Committee on Survey of Ground Water Supplies in New England
12 Committee on Rainfall and Yield of Drainage Areas
16 Committee on Coefficients for Friction in Pipe Lines
19 Committee on Water Quality and Treatment
21 Committee on Specifications for Cast Iron Pipe and Fittings
22 Committee on Reinforced Concrete Pressure Pipe
23 Committee on Code for Pressure Piping
24 Committee on Laying Cast Iron Pipe
25 Committee on Specifications for Steel Pipe
26 Committee on Standardization of Pipe Flanges and Fittings
28 Committee on Steel Standpipes and Elevated Tanks
30 Committee on Meter Specifications
32 Committee on Gate Valves
37 Committee on Federal Activities
38 Committee on Fluid Permeability
39 Committee on Deep-Well Vertical Pumps
42 Committee on Conservation, Development and Utilization of Water Resources
44 Committee on Publicity
45 Committee on Recreational Uses of Public Water Supplies
46 Committee on Plastic Pipes and Plastic Linings for Water Supply Uses

47 Committee on Methods of Financing Water-Main Extensions
49 Committee on Water-Works Safety Practice
50 Committee on Prestressed Concrete Water-Storage Tanks

During the year the Committee on Standardization of Pressure and Vacuum Gages was reactivated as NEWWA 51, and it is recommended that it also be continued.

The Committee on Committees has received a suggestion that a committee on water rates in New England be established and the Committee has this matter under consideration.

While not all the Chairmen were able to submit reports at this convention, the work of their committees is continuing, and the Committee on Committees wish to thank the Chairmen and members for their continued support in this important work of the Association.

Respectfully submitted,

COMMITTEE ON COMMITTEES

REPORT OF COMMITTEE ON RECIPROCAL RELATIONS WITH INSTITUTION OF WATER ENGINEERS (LONDON)

September 21, 1959

To the New England Water Works Association:

Your Committee on Reciprocal Relations with the Institution of Water Engineers presents its annual report for 1959.

The Diploma of Merit from the Institution was awarded this year to William D. Monie and Harold B. Scales of the Portland Water District for their paper, "Maintaining Pipeline Coefficient 'C' after Water-Main Cleaning", published in the September, 1957, issue of the JOURNAL OF THE NEW ENGLAND WATER WORKS ASSOCIATION.

Your Committee records with regret the death last March of F. H. Bullock, past-president of the Institution of Water Engineers, who received the New England Water Works Association Award in 1958, presented in person by the chairman of your Committee. Mr. Bullock was a distinguished water-works engineer and manager, whose death is a distinct loss to the water-works profession in England.

Within the year New England and some of its water works have been visited by R. C. S. Walters, past-president of the Institution, and Mrs. Walters, and by Mr. Leonard Millis, Executive Secretary of the British Water Works Association, and Mrs. Millis. Mr. Millis is also Secretary-General of the International Water Supply Association and as such is interested in securing cooperation of American water-works men. In this connection your Committee suggests that consideration be given by the New England Water Works Association to participation in furthering an International Water-Supply Congress in Boston in the future, when suitable convention facilities will be available.

Respectfully submitted,

DONALD C. CALDERWOOD
PERCY A. SHAW
(*Signed*) E. SHERMAN CHASE, *Chairman*

REPORT OF THE COMMITTEE ON WATER QUALITY AND TREATMENT

September, 1959

To the New England Water Works Association:

This committee last reported to the Association in 1955. It considers its purpose to be to inform the Association, in progress reports, of developments of current interest and to make special reports on subjects assigned it by the Association.

Developments in the field of water quality and treatment of current interest are as follows:

1. *Compulsory Filtration of Surface Supplies.*
   At the May 21, 1959 meeting in Manchester, N. H., the Association adopted a resolution presented by the State Sanitary Engineers of New England, placing it on record as opposed to a recommendation of Region No. 4 of the Association of State Sanitary Engineers to the U.S. Public Health Service that drinking water standards be revised to require filtration of all surface water supplies. The recommendation may be construed as an alternative to the maintenance of strict watershed sanitation which is the adopted policy of this Assocation.

2. *Contamination of Ground Waters by Synthetic Detergents.*
   The increasing use of synthetic detergents, and the fact that certain types of them are resistant to biological decomposition, has caused the contamination of ground water supplies by cesspools and septic tank systems, the synthetic detergents passing through the ground unchanged. This resistance to biological decomposition, and the fact that they do not occur naturally, renders the synthetic detergents a positive proof of contamination.
   Studies of contamination of ground water by detergents are under way, and intensive research is needed on the effects of different types. This is a serious public health problem, as separating distances between wells and sources of contamination adequate heretofore are too small when synthetic detergents are present.

3. *The Status of Fluoridation.*
   The number of persons drinking fluoridated water continues to increase, but at a diminishing rate. The principal advocates of

fluoridation—the State Health Departments and the Dental and Medical Associations—rest on their earlier endorsements of the practice, and the statistics bear out the claimed reduction in dental caries by fluoridation. The opposition to fluoridation, however, is persistent and vociferous, and is based on the non-technical grounds of invasion of human rights, and upon fear of possible side effects. Last year Massachusetts enacted a law requiring approval of fluoridation by referendum before local adoption.

4. *Approval of Polyelectrolytes as Coagulant Aids by U.S.P.H.S.*

Of interest to operators of rapid sand filtration plants is the approval, by the Technical Advisory Committee of the U.S. Public Health Service, of the following coagulant aids in the treatment of water for drinking. The approval concerns only the health aspects of these products and does not constitute an endorsement or an indication of their effectiveness.

Product	*Manufacturer*
Claron	Allyn Chemical Co.
Burtonite No. 78	The Burtonite Co.
Drewfloc	E. & F. Drew Co., Inc.
Coagulant Aid No. 2	Hagan Chemicals & Controls, Inc.
Coagulant Aid No. 7	Hagan Chemicals & Controls, Inc.
Coagulant Aid No. 11	Hagan Chemicals & Controls, Inc.
Coagulant Aid No. 18	Hagan Chemicals & Controls, Inc.
Carboxymethylcellulose	Hercules Powder Co.
Kelgin W	Kelco Co.
Kelcosol	Kelco Co.
Permutit No. 65	The Permutit Co.
Permutit No. 66	The Permutit Co.
Permutit No. 67	The Permutit Co.
Jaguar	Stein, Hall & Co.
Nalcolyte 110	Nalco Chemical Co.

Respectfully submitted,

EDWARD S. BROWN, JR.
EDWARD W. MOORE
CLAIR N. SAWYER
WARREN J. SCOTT
ERNEST A. SNOW, JR.
DAVID H. TURCOTTE
(*Signed*) GEORGE G. BOGREN, *Chairman*

PROGRESS REPORT OF COMMITTEE ON SPECIFICATIONS FOR CAST-IRON PIPE AND FITTINGS

September, 1959

To the New England Water Works Association:

The Committee on Specifications for Cast-Iron Pipe and Fittings (NEWWA 21) presents the following report:

This committee is comprised of a single member who serves as NEWWA representative on ASA Sectional Committee A21-Cast-Iron Pipe and Fittings. The writer has taken the place of Mr. Arthur Shaw, who resigned from the committee.

One meeting of the Committee was held in New York on November 21, 1958. This meeting was largely devoted to organizational procedure. A subcommittee did report on consideration of the relation of Sectional Committee A-21 to the National Standards Organization.

The chairman of the above subcommittee recommended that the studies of Sectional Committee A-21 be changed from "Observer" to "Participating." There were objections to such change and, by vote of the Committee, it was referred to the sponsors of members of A-21 for instruction. The writer presented the suggested change in status to NEWWA. By letter he was instructed by the Executive Committee of the Association to inform the ASA Committee that the NEWWA approved of such change.

The writer was appointed Vice Chairman of Subcommittee No. 1—Pipe. This subcommittee has held two meetings at New York: January 26 and May 22. The necessity for revision of each ASA Specification for Cast-Iron Pipe is being considered. A number of revisions have been suggested to eliminate obsolete material and to provide for changes in manufacturing procedure. No recommendations as yet have been submitted to the main committee.

It appears essential that NEWWA 21 be continued.

Respectfully submitted,

(*Signed*) EDWIN B. COBB, *Chairman*

REPORT OF COMMITTEE ON STANDARDIZATION OF PIPE FLANGES AND FITTINGS

September 18, 1959

To the New England Water Works Association:

Your committee No. 26, entitled "Committee on Standardization of Pipe Flanges and Fittings", reports that during the last year it has been in contact with the various subdivisions of the ASA committee B16 having to do with iron and bronze fittings and flanges.

While the bulk of the activity of the ASA committee has to do with other fields than the water-works industry, your committee does review the actions of this committee so as to keep in touch and thereby protect the interests of the water-works field. At the moment, there is considerable activity in revisions to these standards, but nothing which we feel needs action or attention by the water-works people at this particular time.

Respectfully submitted,

(*Signed*) J. P. HENNINGS, *Chairman*
F. J. TURNBULL

REPORT OF COMMITTEE ON METER SPECIFICATIONS

This committee (NEWWA #30) is joint with A.W.W.A. A manual covering installation procedures and testing methods has been developed and is now being published piecemeal. The first installment is in the June, '59, A.W.W.A. Journal. The manual in final draft form is forwarded herewith. The last chapter is not ready, as it involves a revision of meter specifications. This project is just getting under way, and Committee N.E.W.W.A. #30 should be continued until the work is done. The undersigned would appreciate the secretary's reporting these facts at the convention.

(*Signed*) REEVES NEWSOM, *Chairman*

REPORT OF COMMITTEE ON GATE VALVES FOR ORDINARY WATER-WORKS SERVICE

September 21, 1959

By vote of the Executive Committee on January 15, 1959, Mr. J. Samuel Slicer, Jr., and the writer were appointed representatives of the NEWWA on the joint AWWA-NEWWA Committee C 500 on Gate Valves for Ordinary Water-Works Service. At that time a draft of a revision of the 1954 Standard for Gate Valves had already been prepared and submitted to committee members for review and comments. This revision was to be submitted to the AWWA Board of Directors at its January, 1959, meeting for approval as a Tentative Standard.

Your representatives met and reviewed the draft form and, on January 26, wired the Secretary of the AWWA, suggesting certain changes in the Tentative Standard. On January 29 the AWWA Board of Directors voted to approve the Standard for Gate Valves as Tentative, subject to subsequent amendments.

These Tentative Standards, amended to incorporate numerous changes suggested by your representatives and others, were published in the July, 1959, issue of the AWWA Journal. It is understoood that, subsequently to its publication, suggestions for further revisions have been forwarded to the AWWA office. It is therefore likely that the Tentative Standards will be further amended prior to acceptance as a Standard.

Your representatives therefore recommend that no action be taken by this Association towards approval or publication of this Standard until further consideration has been given to the suggested amendments.

Respectfully submitted,

J. Samuel Slicer, Jr.

(*Signed*) Richard H. Ellis

PROGRESS REPORT OF COMMITTEE ON DEEP-WELL VERTICAL PUMPS

September, 1959

To the New England Water Works Association:

The Committee on Deep-Well Vertical Pumps (NEWWA 39) presents the following report:

This committee is comprised of a single member who serves as NEWWA representative on ASA Committee B-58. The ASA Committee is charged with the preparation of Standard Specifications for Deep-Well Turbine Pumps of both the line-shaft and submersible types. In addition, it is to prepare a Field Test Code for these pumps.

Standard Specifications for Deep-Well Turbine Pumps (ASA 58.1-1955) were published in the July, 1955, issues of the Journals of the American Water Works Association and New England Water Works Association.

Standard Specifications for Submersible Pumps were submitted for approval at the AWWA Convention at San Francisco in July, 1959. Presumably, these specifications will be published in the near future.

Due to the fact that ASA has discontinued the B-17c Transmission Shafting Code, it has been necessary for the B-58 Committee to prepare a substitute.

A tentative draft of the Field Test Code for both Line-Shaft and Submersible Deep-Well Turbine Type Pumps was prepared by a committee task force and submitted at a committee meeting in San Francisco this summer. The writer attended this meeting. Rather extensive changes in the Test Code were suggested and it will be returned to the task force for revision.

We recommend that the NEWWA Committee 39 be continued until the Field Test Code is completed.

Respectfully submitted,

EDWIN B. COBB, *Chairman*

REPORT OF THE COMMITTEE ON CONSERVATION, DEVELOPMENT AND UTILIZATION OF WATER RESOURCES

September 21, 1959

To the New England Water Works Association:

Since the establishment of this committee in 1951, the Nation has become increasingly conscious of the importance of our water resources. State legislatures are giving more and more attention to water resource matters and several of the New England States have established water resources commissions to plan and carry out orderly programs for the conservation and development of their water resources. On the Federal level of government, Congress and the President are cognizant of the many problems involved and have initiated studies to aid in the formulation of water policies. In this connection the 86th Congress recently passed Senate Resolution 48 establishing the Senate Select Committee on National Water Resources. This Committee is charged with developing information regarding the quantity and quality of water that will be needed by population, agriculture and industry between now and 1980, and with making recommendations that may guide future water policies. Congressman Kerr will chairman the Committee which has scheduled public hearings for New England in December.

The most outstanding program in water resources conservation is the nation-wide crusade for clean waters. In New England, each State has under way an extensive pollution control program and is coordinating its efforts through the New England Interstate Water Pollution Control Commission where interstate waters are concerned. To facilitate the construction of sewage treatment plants, Congress, through the enactment of Public Law 660 of 1956, has made construction grants available to municipalities. Since that time there have been 67 sewage treatment projects costing $36 million approved for Federal grants in New England. Seventeen of these projects have been completed and 23 are under construction.

In Maine, New Hampshire and Vermont the Legislatures have provided State financial assistance to supplement the Federal grants. Legislation was introduced into the 86th Congress

to double the annual appropriation authorized for grants under Public Law 660. The measure was passed by the House and in a modified form by the Senate. The 1st Session of the 86th Congress ended before the Senate and House could concur on the provisions of the bill. This legislation will be revived when the 2nd Session convenes in January, 1960.

Reference has been made in previous reports to the Northeastern Resources Committee which was formed in 1957 to follow through on the proposals in the report of the New England-New York Inter-Agency Committee relative to the area's natural resources. The Committee, which is composed of representatives of the seven Federal agencies concerned with natural resources and the New England States, has proposed a compact between the United States and the six New England States. The purpose of the compact, which creates a Northeastern Resources Commission for its administration, is to provide improved facilities and procedures for the coordination of the policies, problems and activities of the several States in the field of water and related land resources. To date, the compact has been ratified by the legislatures of Connecticut, Massachusetts and Rhode Island.

The Water and Sewage Works Manufacturers Association is launching a national program to inform the voters of the need for enlarged water and sewage facilities. Plant investment and expansion are not keeping pace with requirements and a recent survey has shown that the public is ill-informed in such matters. This educational program of the water and sewage works industry will be carried out through newspapers, magazines, radio and television, films and special publications.

Your committee will continue to keep the membership of NEWWA informed of activities in the water-resources field, in order that appropriate action may be taken relative to the formulation of policies and legislation.

Respectfully submitted,

(*Signed*) HARRY MANSON, *Chairman*
PETER C. KARALEKAS
JOSEPH C. KNOX
WALTER J. SHEA

REPORT OF COMMITTEE ON PLASTIC PIPES AND PLASTIC LININGS FOR WATER-SUPPLY USES

To the New England Water Works Association:

The Committee again calls attention to the 1959 Seal of Approval of the National Sanitation Foundation Testing Laboratory for up-to-date information on many plastic materials reported satisfactory for water-supply use. Many changes from the 1958 listing will be noted.

As a result of further testing at the Lawrence Experiment Station on plastic pipes, further persistent tastes and odors have been found which seem to be connected more directly with fittings and pipe cements than with the pipes proper. These findings tend to indicate that the only really safe procedure for use of a given pipe with a given water lies in direct on-the-spot testing.

Longitudinal cracks observed in smaller sizes of polyethylene pipes were found to result from compression fittings. It appears that fittings in some cases have not kept pace with the general improvement in pipe.

The three types of pipe and fittings, polyethylene, polyvinylchloride, and rubber modified styrene, which have been kept entirely or partly submerged in sewage for over two years have continued to show practically no signs of deterioration.

JOSEPH MCCARTHY

REPORT OF COMMITTEE ON WATER-WORKS SAFETY PRACTICE

To the New England Water Works Association:

During the past year the Committee on Water-Works Safety Practice has contacted all of the water utilities in New England, which are represented in the American Water Works Association, for the purpose of obtaining safety records, to establish which such agencies were eligible for Safety Awards of the A.W.W.A. Of the questionnaires sent out to cover the year 1958, 42 were returned and 23 of those submitted had such excellent safety records that Safety Awards were made. These awards were presented on March 19, 1959, and are based on the number of lost-time injuries, man-hours worked, and the number of employees. A summary of the data leading to the awards is presented in the tabulation appended.

It is gratifying to this Committee to learn that there has been an increasing interest in the Safety Award Program, and this should lead to better safety records among water utilities.

The Committee again urges that at least one superintendents' or chemists' "Round Table" discussion during the coming year be devoted to Water-Works Safety Practices.

It is urged, also, that all water utilities in New England adopt a safety program, which will not only promote the efficiency of operation but save time and money in preventing lost time due to careless accidents.

Respectfully submitted,

HERMAN BURGI, JR.
MARK F. CROKER
LENDON F. DUTTON
PHILIP J. HOLTON, JR.
JAMES A. SWEENEY
(*Signed*) RALPH M. SOULE, *Chairman*

Agency	Year	No. of lost-time injuries	No. of days lost—injuries	Permanent disabilities	Fatal injuries	Average no. of employees	Man-hours worked	Injury-frequency rate	Remarks
Connecticut									
Torrington Water Co.	1957	4	73						
	1958	0	0	0	0	14	30,120	0	Award of Merit
Maine									
Brunswick-Topsham Water District	1956	0	0						
	1958	0	0	0	0			0	Award of Merit
Kennebec Water District	1957	2	31				49,600	40.4	
	1958	1	3	0	0	20	41,300	23.2	Award of Progress
Newport Water Co.	1949–57	0	0						
	1958	0	0	0	0	1	2,400	0	Award of Merit
Presque Isle Water District	1954–57	0	0						
	1958	0	0	0	0	8	17,000	0	Award of Merit
Winterport Water Co.	1949–57	0	0						
	1958	0	0	0	0	1	2,000	0	Award of Merit
Woodland Water & Elec. Co.	1957	0	0						
	1958	0	0	0	0	3	5,000	0	Award of Merit
Bath Water District	1957	0	0						
	1958	0	0	0	0	16.4	32,800	0	Award of Merit
Winthrop Water District	1957	0	0						
	1958	0	0	0	0	3	8,000	0	Award of Merit
Massachusetts									
Ashburnham Water Dept.	1949–57	0	0						
	1958	0	0	0	0	3	7,000	0	Award of Merit
Brookline Water Dept.	1957	1	113				110,000	9.1	
	1958	1	226	0	0	52	50,005	20	Award of Honor
Hingham Water Co.	1957	1	13	0	0	25	47,832	0	
	1958	0	0	0	0	23.9			Award of Merit

Agency	Year	No. of lost-time injuries	No. of days lost—injuries	Permanent disabilities	Fatal injuries	Average no. of employees	Man-hours worked	Injury-frequency rate	Remarks
Massachusetts (continued)									
Newton Water Dept.	1957	4	13					36.8	
	1958	1	5	0	0	57.5	115,014	8.7	Award of Honor
West Bridgewater Water Dept.	1954–58	0	0						
	1958	0	0	0	0	4.29	8,598	0	Award of Merit
Grafton Water Co.	1952–57	0	0						
	1958	0	0	0	0	1	2,000	0	Award of Merit
Massachusetts Water Works Co.	1957	1	80						
	1958	0	0	0	0	10	21,629	0	Award of Merit
Oxford Water Co.	1952–57	0	0						
	1958	0	0	0	0	1	2,000	0	Award of Merit
Wannacomet Water Co.	1957	0	0						
	1958	0	0	0	0	13.4	26,721	0	Award of Merit
Rhode Island									
Bristol County Water Co.	1957	3	116	0	0	33	64,839	46.2	
	1958	0	0	0	0	29.9	58,939	0	Award of Merit
Westerly Water Dept.	1957	0	0	0	0				
	1958	0	0	0	0	31	62,000	0	Award of Merit
Vermont									
Manchester Water Co.	1949–57	0	0			2	3,905		
	1958	0	0	0	0	2	4,576	0	Award of Merit
St. Johnsbury Water and Sewer Department	1954–57	0	0						
	1958	0	0	0	0	4	2,652	0	Award of Merit
New Hampshire									
The Hampton Water Works Co.	1952–57	0	0						
	1958	0	0	0	0	9	20,587	0	Award of Merit

PROGRESS REPORT OF COMMITTEE ON SPECIFICATIONS FOR PRESTRESSED CONCRETE WATER-STORAGE TANKS

September, 1959

To the New England Water Works Association:

While the official duty of this committee is to prepare a Standard Specification for Concrete Prestressed Water-Storage Tanks, it feels that a review of the history of such tanks in northeastern United States and of present construction practice will be of value. This committee plans, therefore, to undertake such reviews.

To date, the Committee has held two meetings. At the first meeting the question was raised as to the desirability of preparing a Standard Specification for Prestressed Tanks. After careful discussion, the Committee agreed that such specifications would be useful but, on the other hand, that every effort should be made to prevent spreading the impression that the Association was endorsing the use of concrete water-storage tanks. The success of prestressed concrete water-storage tanks depends to a large degree upon the skill and competence of the constructer. Therefore, the purchaser should consider carefully this item when making his selection between steel and concrete tanks.

The Committee is compiling a history of failures or defects in construction encountered with prestressed concrete water-storage tanks. Also, a list of installations in the New England, New York, and New Jersey areas has been compiled, and the specifications used for these installations are being reviewed.

Committee members have been assigned to investigate the following:

Quality control
Problems peculiar to large tanks
Method of checking the tensions in the prestressing wires
Desirable accessories
Advisability of painting

Committee Member O'Neil has inspected a number of installations and has gathered pertinent information and photographs of each installation he has visited. Mr. O'Neil reported on his inspection of 7 installations at the last meeting of the Committee. He was instructed to continue further inspection trips insofar as he is able.

The Committee is also investigating the advisability of having two Standard Specifications to cover the two basically different types of prestressed tanks (i.e., the concrete core-wall tanks and the steel-diaphragm Gunite tanks).

Inasmuch as this committee is only just getting started with its work, it appears desirable that it be continued for at least another year.

Respectfully submitted,

(*Signed*) EDWIN B. COBB, *Chairman*

REPORT OF THE COMMITTEE ON SPECIFICATIONS FOR STEEL PIPE

September, 1959

To the New England Water Works Association:

This committee of your Association acts jointly with Committee 8310D of the A.W.W.A. on specifications and other matters concerning steel water pipe, and questions on this subject which are of interest to the Association requiring committee recommendations occur from time to time.

During the present year there was no work on which the Committee needs to report.

However, it is recommended that the Committee be continued in anticipation of matters which may need attention in the future.

Respectfully submitted,

(*Signed*) CHESTER J. GINDER, *Chairman*
CHARLES B. HARDY

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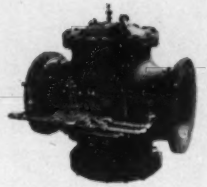

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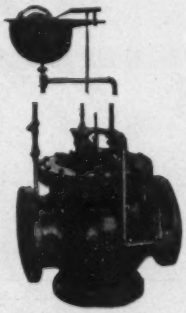

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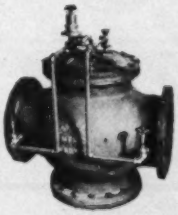

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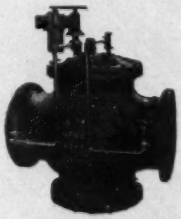

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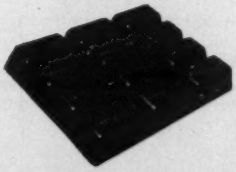

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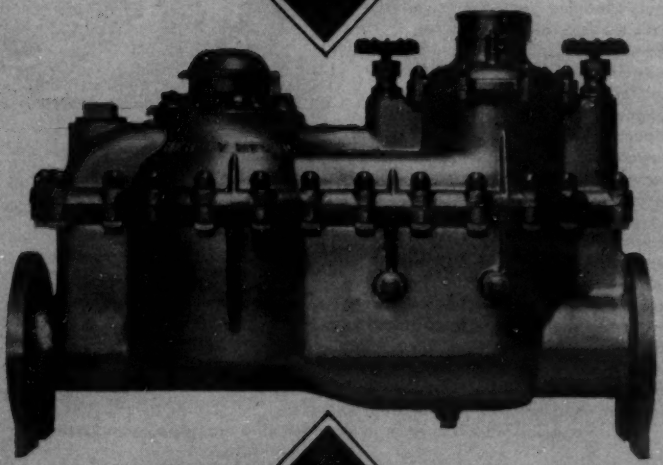

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FIG. 56

- Inside Screw
- Non-Rising Stem
- Parallel Seats
- Bell Ends

FIG. 571X

- Inside Screw
- Non-Rising Stem
- Parallel Seats
- Mechanical Joint Ends

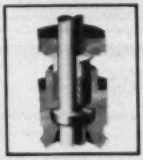
FIG. 561

- Inside Screw
- Non-Rising Stem
- Parallel Seats
- Flanged Ends

FIG. 566

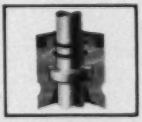
- Outside-Screw-and-Yoke
- Rising Stem
- Parallel Seats
- Flanged Ends

Construction features . . .



Conventional stuffing box

with adjustable gland has ample space for packing that conforms to Federal specification HH-P-106c. The bottom face of the stuffing box flange is faced smooth to form bearing surface for stem thrust collar.



O-Ring seals

once installed no adjustment of any kind is required. The top O-Ring is the dirt seal and the bottom O-Ring is the pressure seal.

Operating nut

is Higher Strength Cast Iron. The base flange, with arrow indicating direction to open, is shaped to permit access from ground surface to adjust gland nuts with an extension socket wrench.

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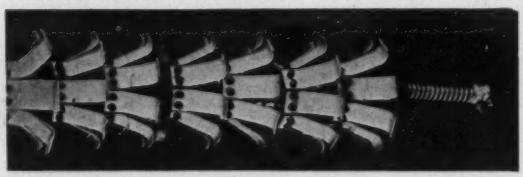

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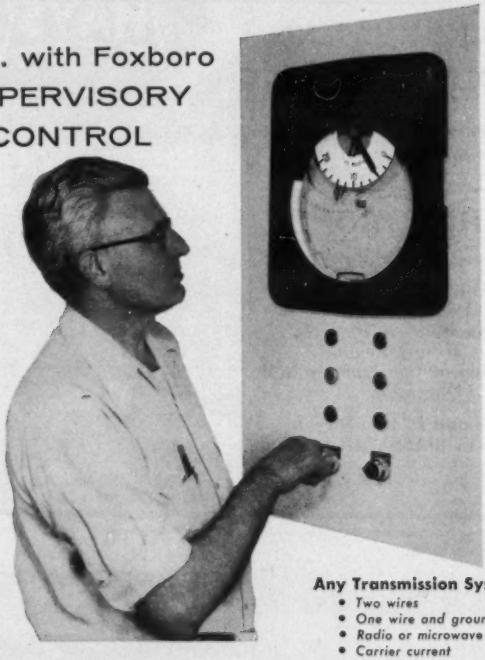

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